April 1941

CONSUMERS' RESEARCH BULLETIN

General Bulletin Number

Contents for April 1941

	Page
Off the Editor's Chest	1
Furniture, Part I, by *M. M. Smith*	2–5
Paints for the Home	6–9
Men's Rubbers and Women's Galoshes	10–11
Corrections	11
Welfare Economics *vs.* Consumer Welfare—A Review	12–15
Dictionaries and Children's Anthologies, An Appraisal by *Professor MacEdward Leach*—Part II	15–18
How to Care for Porcelain Enameled Ware	18
Planting Design—A Review, by *Charles H. Connors*	19
Selecting a Farm Tractor, by *Carlton L. Zink*	20–23
Electric Motors for Home Use	23–25
Garden Seeds	25
Miscellaneous New Listings	26
Preventing Mildew	26

April 1941

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Symbols used to indicate sources of data and bases of ratings:

A—recommended on basis of quality
AA—regarded as worthy of highest recommendation
B—intermediate with respect to quality
C—not recommended on basis of quality
cr—information from Consumers' Research's own tests or investigations
1, 2, 3—relative prices, 1 being low, 3 high. ¶Note that price and quality are completely differentiated in CR's listings; a *quality judgment is independent of price.*
40, 41—year in which test was made or information obtained by the staff of Consumers' Research

Off The Editor's Chest

FOR at least twenty years the writer of these lines has had frequent and varied contacts with trade associations—associations of businessmen set up to serve their membership on all sorts of legal and commercial matters affecting a whole trade or industry. (Some trade associations are very powerful, and wield tremendous influence over prices and standards of conduct in their trades; altogether there are around 2000 of them, hundreds being national and the rest state-wide, regional, or local.) The officers and staff of most of them lack the imagination or foresight to see that just dealings with the public might actually be profitable in the long run, and because of this lack they devote a considerable share of their activities to helping their membership take advantage of consumers in one way or another (ways bad for business, in the long run). Well-known concerted activities of automobile dealers' associations in bringing about the destruction of used cars to prevent their competing with new cars, are a case in point. Dealers in typewriters and many other kinds of appliances have followed similar practices, and have price-fixed the turn-in allowances on secondhand machines, radio sets, and the like, that have been permitted to escape the break-up man's sledge.

Price-stabilizing, price-fixing, and price-raising activities are and have been typical of trade associations. By a revolutionary change in governmental policy, such practices, during the NRA period, were not only permitted but were made obligatory upon trade association members and independent enterprisers alike, and the government participated as guide, adviser, and friend in the activities of fixing prices and terms and limiting commodity grades and qualities. The manufacturer or dealer who carried on the very acts of competition which up to that time had been everywhere held to be the very foundations of the characteristically American system of doing business, then became subject to the direst penalties of law; he was made the target of a blistering fire of governmental publicity and was publicly pilloried as a "chiseler," one who worked against the social and economic welfare of labor and of the general public.

The unparalleled material success of the American economy is based, as the maturer experts in economic theory believe, on the view (which has never found legal or general acceptance in European countries) that it is in the public interest that natural business competitors—men in the same line of industry and trade—should continuously and energetically vie with each other in competition for consumers' custom, by a never-ending competitive lowering of market prices and ceaseless competitive advancements in quality of goods and services rendered. That is basically what a business or laissez-faire economy *means*. It would not be an economy rooted in business enterprise if such competition were not of the warp and woof of trade and commerce. Lack or limitation of such competition would necessarily result in the growth of a state-controlled or regimented economy such as is found in Germany, Russia, Italy, and Japan.

The gouging of consumers by manufacturers and dealers who do not compete, but act concertedly against the public interest by price-fixing, quality-restricting, and overstandardization of product, is fortunately still subject to statutory penalty under the laws of many states. On the other hand, in some states—Pennsylvania and Wisconsin, for example—there are laws which *prohibit* dealers in certain lines of trade from competing or selling against each other; such laws go so far as to prevent newcomers from entering into trade or business except by the permission of officials. Enterprisers in certain fields are even forbidden to keep their accounts to suit their own business purposes, but must follow set forms prescribed by state supervisory officials.

It will be to the interest of consumers to study and understand the effects of all such statutes as those last mentioned, which tend either to prohibit, discourage, or hamper competition, or give a government official power to say how much and under what conditions it may be exercised. Teachers and students of economics and consumer problems should investigate and report in professional papers and college theses, the operation of local laws and trade association "codes of business conduct" which tend primarily to restrict and hamper, rather than enlarge, the degree and scope of competitive business activity.

F. J. S.

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Furniture—I

This is the first part of an article on furniture by a recognized furniture expert who writes here under a pseudonym. The first part deals with what in the trade is called case goods—that is, wooden furniture not upholstered. The second part, scheduled for a forthcoming Bulletin, will deal with upholstered furniture.

by M. M. Smith

Furniture may be classified roughly into two general groups, namely, case goods and upholstered furniture. Price competition has forced manufacturers of popular grades of furniture to resort to mass production methods, and all too often, sound engineering and furniture manufacturing practices have been sacrificed to speed-up and short-cut methods. The market is flooded with low-quality furniture. Much of this is sold under private brand names of department stores with no identification of the manufacturer.

Let us approach the problem of buying wooden furniture and try to bring order out of the confusion experienced by most customers in making a purchase. First, decide what you want, and arrive at some decision as to style. This is best done by shopping around, gaining an idea of what is available, and deciding upon the approximate price range that you can afford.

And don't forget utility. Is the piece too big for your room? Do the mechanical parts, such as the opening device on dining-room tables, work smoothly? Do not pass hastily over small details. Many of these may cause serious trouble after years of use. If you are interested in chests of drawers, see whether the drawers are full size. It is common practice in the making of skimped furniture to furnish drawers which extend only a part of the way toward the back of the case. Also check to see whether the case is tight enough to keep out dust. Remember that dust panels do very little good if drawers are loose and if the case, or box-structure enclosing the piece itself, is not tightly constructed. Avoid needless ornaments on the outside of the glass of china closets and moldings that may turn into dust collectors. Make your examination with care and you will avoid drawers that twist and stick, door latches that fail to open or close nicely, beds that have a chronic squeak, and all of the thousands of little things that may rob you of the pleasure and economy of having made an otherwise good selection.

The next step is to consider carefully the appearance of the furniture. Does the design appear well-balanced as a whole? Is the surface smooth and free from flaws? Examine the finish closely to see whether it is fairly thick. If it is too thin, you will find spots that are almost bare. A thin finish will not last long and is almost impossible to repair in the event of damage. Observe whether the wood has been uniformly stained, whether the pieces in a suite match, and examine the posts to see that they match the veneers. Solid wood parts, it should be noted, will never quite match veneers, due to differences in grain structure, but this difference is not objectionable if good sense and good workmanship have gone into the staining job. The surface should be adequately filled. Before the superficial finishes are applied the wood is "filled" with a paste material that plugs or fills the pores of the wood; this allows the top coats to go on without sinking into the wood. If the surface presents a grainy appearance, you can safely assume that the wood has not been filled properly.

Finishes on Furniture

Beware of thick deposits of finish in corners and in routed or "carved" lines, giving to the furniture an untidy appearance. Such deposits, and stains on the interiors, drawer bottoms, and case backings are evidence of careless factory procedures and warn one to be on guard against other defects.

Furniture finishes have topcoats either of lacquer or varnish. The surface should be smooth and free from air bubbles, ripples, and thin spots. A person who has done furniture finishing himself at home can sometimes make a crude test with a fingernail on an inconspicuous part to help him decide whether the coating is hard enough. Bleached finishes are somewhat unreliable since they have a tendency to darken in spots through exposure to sunlight or where the wood had sap stains before it was bleached.

The so-called "photo finish" is actually a printed veneer pattern on solid wood furniture. It goes without saying that this furniture should not be represented as being veneered or made entirely of the wood imitated by the pattern. This type of finish is easily distinguished by its uniform and too-perfect appearance, and by examining drawer edges to see whether they are actually veneered or of solid stock. A "photo finish" has the disadvantage of being difficult to repair in the event of damage. In other respects, it will give good service, but be sure it has been applied to a structurally sound case.

Panel Construction

The next point to consider is panel construction. Thin panels, usually used for backings and ends, are made by gluing three distinct layers of wood together. To guard against warping, the outside layers are glued to the center layer with grains run-

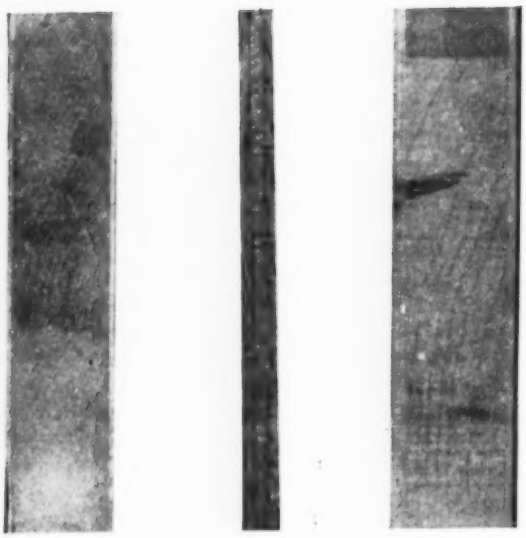

Fig. 1—Three kinds of panel. At the left is an undesirable type of three-ply panel, with a heavy core and thin face and back veneers; this is often used in cheap furniture, but gives trouble with warping and checking. The three-ply panel shown in the middle is satisfactory for framed ends, drawer bottoms, and backings of dressers, chests, etc. The five-ply panel shown at the right, consisting of a thin back veneer and crossbanding, a thick core, a thin crossbanding, and then a face veneer, is satisfactory for any part requiring a heavy panel.

ning at right angles to that of the center; the panel is then said to be balanced. Thin three-ply panels have a tendency to buckle even if properly laminated or balanced, and must not be depended upon to remain flat without suitable support. The most common method of support is framing; this should be used where thin panels serve for ends of desks, bureaus, etc., and for dust panels. Back panels applied to chests, dressers, etc., are either set into the back, or simply nailed to the outside of the back frame, since the construction usually does not permit framing.

Wherever there are internal braces or members running along the surface of the panel, the panel should be securely and repeatedly fastened to them so that no large areas of thin panel remain unsupported. An end panel of a desk, for example, should not only be framed, but should be glued to each side drawer support in the case. Thin three-ply panels, glued on the outside of a frame to give the appearance of a heavy end panel, are not practical, although you will find much furniture constructed in this way. Back panels should be tacked or glued to the back drawer supports and at frequent intervals along the edges. With dust panels, it is not enough simply to frame the panel under a full-sized drawer. These should, at the very least, be tacked to the center drawer-guide and, preferably, divided into two pieces and framed under the center drawer-guide. While on the subject of dust panels, it is well to mention that certain manufacturers use a single-ply dust panel. This type is not only subject to warping, but may split, as well.

Three-ply panels are sometimes made in heavier sizes for fronts, tops, and heavy ends of cheap furniture, where five-ply should have been used. In this case, the panel is made of a heavy core with a thin ply on each side. Usually the face and backing veneers are of different woods and exert unequal stresses on opposite sides; the panel, as a result, will warp even though the outside grains run perpendicular to the grain of the core. Without going into a further discussion of the reasons, it can be stated that heavy three-ply panels must be avoided simply on the basis of past performance—they are bad actors. The salesman will often not know the exact number of plies in drawer fronts, end panels, or doors, and you will have to depend upon your own observations. Examination of the edge of the panel will reveal the outlines of the central core and outside plies; presence of heavy three-ply panels is good reason for rejection of the piece of furniture.

Five-ply panels come next above three-ply in orthodox plywood panel construction. These consist of a heavy core crossbanded with a second and fourth ply running perpendicular to the grain of the core, and with outside plies running parallel to the grain of the core. This type is most generally used for drawer fronts, heavy ends, top panels, bed ends, table tops, etc. If the decorative outside veneer, or ply, is a straight grain wood, you have a good chance of getting a sound panel.

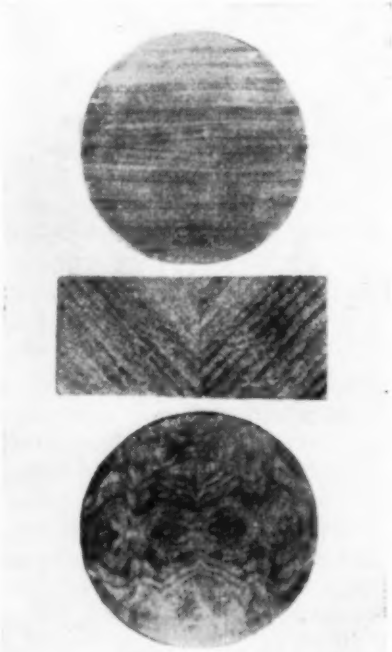

Fig. 2—In low-priced veneered furniture, panels faced with straight or v-grain veneers, shown in the two top illustrations, are usually best. Fancy grains like the butt walnut grain in the bottom illustration should be avoided when low-priced furniture is bought.

Examine the surfaces of veneer panels closely for evidence of wavy appearance, bulges, and slight indentations. These are danger signals that must

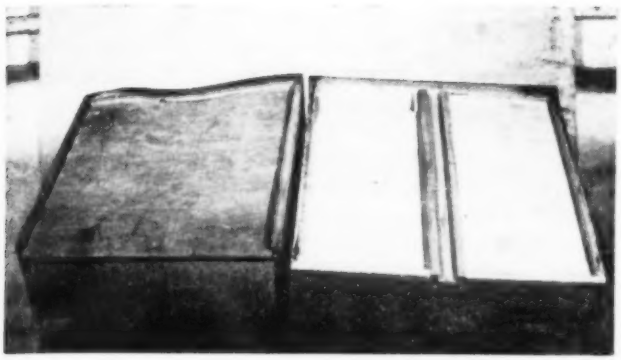

Fig. 3—The drawer bottom at the left is badly constructed, being made of thin three-ply panel that will buckle and warp, and framed and supported only on three edges. The drawer bottom at the right is much better constructed; it is well framed and has a center drawer-guide that serves as a support. Construction would have been improved by additional glue blocks to support the bottom.

not be disregarded. As to swirls, crotches, and other decorative grains, remember that these are subject to checking and other failures, for these veneers are weak and non-uniform in grain direction. They give an unbalanced construction that may cause warping and cracked finishes. Particularly remember that decorative grains are a hazard in furniture of poor grade and workmanship, for they require special skill, care, and experience in manufacture. If you are buying inexpensive furniture, you had better play safe and confine your selection to straight-grain veneers, or at the very most, to v-grains. If you really want the more ornamental grains, you will do well to pay a little more and buy veneers guaranteed to be resin-bonded, or make absolutely certain that the furniture was made in a thoroughly reputable factory of long and recognized standing in the trade.

Resin-bonded plywood has been known for many years to boat builders and airplane manufacturers, but is rather new in the furniture industry. Plywood panels generally are made by gluing plies together with tapioca glues, which are not waterproof and are, therefore, affected by moisture. Wood expands appreciably in a cross-grain direction with increase in moisture content. The expansion and contraction which result from atmospheric moisture changes in the case of ornamental grains constitute a serious problem where vegetable glues are used. Properly made resin-bonded plywood is not affected as much by moisture variations as the vegetable-glued type and should prove a better investment, even at a slightly greater cost.

Solid panels have a definite advantage over plywood in their ease of manufacture and adaptability to cheap furniture. They are not subject to the common ills of peeling and checking; but they have

Fig. 5—Faulty attachment of table legs to central pillar. The legs shown should have been fastened with dowel screws, not with screws such as the cylindrical ones shown in the picture.

a distinct set of troublesome properties of their own, which include warping, splitting, and annoying expansion and contraction with changes in moisture.

When the panels are solid they should be placed in the furniture in a way to allow for plenty of expansion. All panels that are parallel should have grains running in the same direction. It is extremely important to assure yourself that the furniture comes from a reliable manufacturer because a structural defect will cause a great deal of trouble later.

Certain woods, such as maple and birch, naturally lend themselves to solid furniture construction; but there are many cheap imitations of maple made of soft gumwood. Some imitations will give satisfactory service, but you will be wise to guard against misrepresentation. It is peculiar that in the case of furniture the consumer must have the protection of dealing with a reliable store that has a reputation for standing behind its goods and replacing or re-

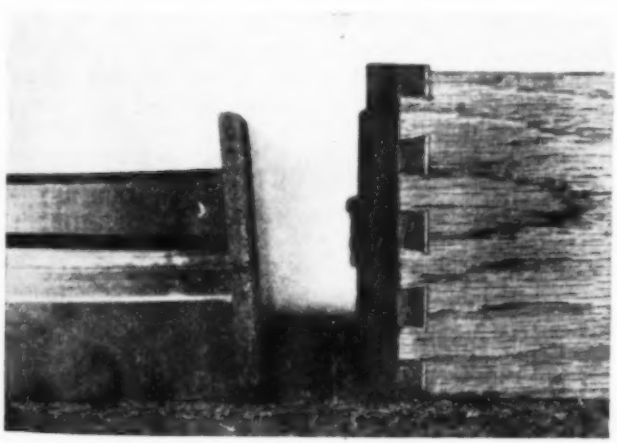

Fig. 4—Bad and good drawer construction. The drawer on the left is held together by nails and will not last. The dovetail construction at the right shows how the corners are framed in the drawers of well-constructed furniture.

pairing faulty articles, for it is impracticable for the average consumer to acquire the expert knowledge of woods and framing to protect himself against all the possible deficiencies and faults of bad manufacturing and design.

Cabinet Construction

As to cabinet construction, there are certain important details to look for. The main body of the furniture should be put together with strongly glued joints; nails or screws cannot be considered a satisfactory substitute. (This should not be construed as meaning that use of screws in combination with glue is undesirable where such construction is used to hold concealed members of the furniture in place.) Look for nails that might have been driven in to steady the piece, indicating either loose joints or that the manufacturer drove in the nails to hold wet glue joints in place after too-early removal of the gluing clamps, to speed up production. This practice usually results in a weak or broken glue bond. After you are satisfied that the major glue joints were correctly made and are strong, check the interior for well-placed reinforcements or glue blocks that will make the case or piece more rigid. See that all internal braces are strong and glued to the outside panels, to exert a strengthening effect upon them.

See that drawers are not simply nailed together but have dovetail joints. In high-grade furniture, the drawer bottom will be strengthened by a slide at the middle. Examine the glue blocks, used under the bottom of the drawers, and see that they are strongly glued and well placed. Glue blocks should appear frequently in the interior of the case, wherever a panel needs support or the case needs strengthening.

The side rails of a bed are often a source of trouble. Veneered rails have less tendency to warp than solid rails, but the edge of the rail should have a molding over it to prevent the veneer from being peeled off at some future time. A metal slat bearer, consisting of a metal angle iron running along the whole length of the bedrail and forming a lock on each end, is a good investment, particularly with solid rails.

Make sure that table legs are constructed so as not to loosen. Check *under* table tops for evidences often found there of poor workmanship or use of shoddy materials. With dining tables, try out the mechanism for putting in extra leaves to make sure that it works easily.

Fig. 6—Double-doweling as shown above should be used on all joints of chair frames.

Chairs should always be doweled and not simply screwed together. Thin, unsupported plywood backs should be avoided. Check all large solid wood areas for evidence of small cracks which warn that the part may split badly or warp later. Legs should be free from flaws and end checks.

Novelty furniture, such as end tables, smoking cabinets, tilt-top tables, etc., have the same general requirements as the larger wood furniture items. Ornamental veneers in cheap items will usually be a source of trouble. Tops, when plywood, should have a minimum of five plies. Legs should be doweled, since parts put together with screws will loosen after a short period of use. Frames of coffee trays, etc., should be rigid and put together with dowels.

CR to the Rescue!

IN a recent issue of your *Bulletin* you advised prospective purchasers of fur coats to inspect the skins before purchase. This advice saved us real money recently. Perhaps you may be interested in the story.

My wife and I visited a large Philadelphia department store, and after selecting a coat asked to see the skin. The coat had to be shortened anyway, so the saleslady after some hesitation agreed to our request. When the coat was opened up it was obvious that both old and new skins had been used in the construction. Many seams were split, and there were holes in the pelts. The old skins had been oiled heavily. We rejected the coat, and then the saleslady tried to convince us that everything could be fixed up to our satisfaction. We were not convinced, so she called the manager of the fur department for support of her arguments. He went into a rage and told the saleslady that customers were unable to judge the value of a coat and that "there wasn't a store anywhere that would open up a coat for customer inspection."

We walked out of that store and went up the street to another place. Our first question was whether inspection of furs was permitted. The saleslady said "Why certainly. We will be glad to show you the skins." We found them almost anxious to open up a few coats. We purchased one, and thanked our lucky stars for being subscribers to CR.

—A Chemist Subscriber

Paints for the Home

This report discusses briefly the composition and characteristics of the two most important types of paint used by the householder, namely, paints for exterior surfaces (house and barn paints), and paints for interiors (walls and ceilings). Some of the technical factors that determine the performance, durability, and appearance of paints are explained so that the consumer may be prevented from making certain common mistakes in the choice of a type of paint or in the mixing of paints having different vehicles, and so that he may understand why some paints are glossy and some dull, and how certain types of paint are incompatible with others when a new coat is to be put over old work.

PAINT products for home use may be divided into four major groups, the first two of which will be discussed in the present report: (1) house and barn paints for exterior surfaces; (2) wall paints for interior walls and ceilings; (3) porch paints and floor paints for surfaces subject to traffic outdoors and indoors, respectively; (4) enamels for trim, cabinets, furniture, etc. In former times, painters were expected to know how to make all of these products by suitably mixing such paint and varnish staples as paste white lead, paste zinc oxide, colors-in-oil, dry whiting, linseed oil, spar varnish, floor varnish, paint drier, and turpentine. Now the various products are usually purchased from paint manufacturers in prepared form. The householder, therefore, whether he is doing his own painting or is hiring a painter, should know the essential differences between the various products and the purposes for which they are suitable. For the diversity and complexity of the field is such that serious mistakes can be made by selecting the wrong product for a given purpose or by mixing, let us say, some left-over wall paint with outside house paint, in a misguided attempt to economize and avoid waste.

House and Barn Paints for Exterior Surfaces

House paints are intended primarily for painting the exterior surfaces of buildings, particularly wood surfaces. Popular preference in colors, based on sound principles of decoration, makes white and the light colors (obtained by tinting white paint) dominant among house paints; sash, trim, and blinds are often painted in dark colors for contrast. While the barn paints were originally formulated to provide economy on buildings of rough construction, the more recent very cheap barn paints of gray, yellow, and other light colors, depart from the reliable quality of the old-fashioned barn paint and are usually merely cheap house paints of doubtful durability. The traditional red barn paint made with iron oxide pigment is well suited to its purpose and gives a very durable coat when well made.

House paints in white and light colors differ in composition from practically all interior paints in three important characteristics. If they are of good quality, (1) considerably more than half of the pigment, by weight, consists of white lead and zinc oxide (or white lead alone if the paint contains no zinc oxide); (2) the volatile thinner and drier together amount to little, if any, more than one-tenth of the liquid part of the paint; and (3) the remainder of the liquid consists entirely or almost entirely of unbodied drying oils, such as linseed oil. (By unbodied oil we mean drying oil that has been processed only enough to make it suitable for paint, but not enough to increase the viscosity or "body" much above that of the crude oil as it occurs in nature.) On paint labels such oil may be called "raw," "boiled," or "refined." If it is called "bodied," "heat treated," or "chemically processed" oil, it presumably has been processed until its viscosity has been increased and its other properties altered. Tung oil and "synthetic" oils in paints are always bodied oils, and whenever a paint formula reports "resin" it usually means that at least a portion of the oil has been cooked with the resin to make varnish, which is a "bodied" oil product. When "varnish" is reported on paint labels it often includes not only the bodied oil and resin that were cooked together but the mineral spirits (volatile thinner) with which it was thinned; the designer of the label, by this practice, is enabled to conceal from the unwary purchaser the fact that a large portion of the paint liquid is volatile thinner, which evaporates from the painted surface, rather than performing a useful service.

House paints need a high proportion of total pigment (about one-fourth of the prepared paint by volume or 60% to 70% by weight for white paint or paints of light colors) but not all of it need be white lead and zinc oxide. The balance is usually made up of titanium dioxide, which provides opacity (hiding power) and whiteness, colored pigments (when required for color), and inexpensive or filler pigments such as magnesium silicate, silica, and barium sulphate. In the formulas printed on labels the content of inexpensive pigments is commonly concealed or minimized by lumping them together with the titanium dioxide under such names as "titanium-pigment," "titanium-magnesium," and "titanium-barium." Manufacturers extol the virtues of titanium pigments, which are useful enough in their proper proportions, in order to distract attention from the downward trend in content of white lead and zinc oxide, and the upward trend in content of magnesium silicate (talc) that has been going on during the last few years.

Paints of dark colors allow the use of very little opaque white pigment and therefore little or no white lead or zinc oxide. Very durable dark-colored paints with the essential properties of house paints can be made by merely substituting the fairly expensive lead chromate or the cheaper ferric oxide (red iron oxide) for white lead and zinc oxide.

Red Barn Paints

The opinion seems to have grown up that red barn paints must always be sold at very low prices, but if paint dealers and manufacturers would spend some of their advertising money in educating farmers to the sacrifices in durability which are necessarily made to get a low price per gallon, this opinion could undoubtedly be changed.

House Paints of Dark Shades

Most paints of the dark colors now on the market differ from white and light-colored paints in the following respects: they contain little or no white lead or zinc oxide; varnish (sometimes bodied oil or synthetic drying oil) is substituted for part or all of the unbodied oil; the level of total pigment is usually rather low; and the content of volatile thinner is high. Such paints often have properties more nearly like enamels than like house paints. They may, however, have excellent durability and hold gloss and color particularly well if the varnish used in them is of good quality.

Primers and Undercoating Materials

Paints of dark colors, with the exception of good-quality red barn paint, are often ill-adapted to priming coat and undercoat work. It is safer to use them for finish coats only. A house paint or a house paint primer conforming to the description of white house paints previously given may be used for the priming coat and undercoat on new woodwork and for the undercoat in repainting, but the white paint should be tinted appropriately, that is, dark gray when the finish coat is to be green, blue, or black, and should be tinted buff when the finish coat is to be brown. For a discussion of the application of various types of house paints and house paint primers, see CR's October 1940 *Bulletin;* for advice on exterior painting, see October 1939 *Bulletin.*

* * *

Ratings of house paints and red barn paints were given in the September 1940 *Annual Cumulative Bulletin* (confidential and available only to subscribers to CR's full service) and additional ones in the October 1940 *Bulletin.* Information subsequently received permits the following *additional listings of house paints,* the formulas for which were incomplete in 1940 but are reported by the manufacturer to be correctly presented on the labels for 1941.

A. Recommended

Barreled Sunlight Outside White, No. 266 (U.S. Gutta Percha Paint Co., Dudley St., Providence, R.I.)

B. Intermediate

Barreled Sunlight Outside White, No. 134 (U.S. Gutta Percha Paint Co.)

Wall Paints for Interiors

Wall paints are made primarily for plaster walls and ceilings but are used also on fiber boards, plywood, and other interior wall coverings, including wood trim. House paints should not be applied to interior surfaces, not only because they are usually more expensive than necessary for the purpose, but because they may perform less satisfactorily. For example, house paints may turn yellow and the surface may remain tacky unduly long indoors where they are exposed to much less sunlight than they are designed for. Moreover house paints, when soiled, are more difficult to wash properly than are wall paints and enamels; the desirable colors for house paints are rarely satisfactory indoors; and most house paints contain lead pigments, which should be avoided in interior paints because of the possibility of lead poisoning as the paint ultimately fails and, in part, at least, comes off the walls. So-called house paints, or outside paints, should be used outdoors only, and interior paint or enamel should be bought for all surfaces indoors.

The cheapest paint for interior walls is calcimine. It dries with a "dead flat" surface (which is usually desirable) and it is available in attractive colors, but finger marks and other dirt cannot be washed off, and it is easily damaged by water. Casein paint costs more than calcimine but less than good oil paints; it is similar to calcimine in appearance, stands wetting by water, and can be washed once or twice if the washing is done carefully, with light strokes and without scrubbing. Only superficial dirt can be washed from casein paint; liquids and greases penetrate deeply and cannot be washed off.

Oil paints are less porous (absorptive of liquids) than water paints and are therefore more resistant to water. Liquids and greases can be removed by washing, and more thorough and repeated washing can be carried out. The flat oil paints are not so nearly "dead flat" as the water paints and, hence, lack the especially pleasant appearance which many people find in calcimine and casein paints (possibly due to the uniformity of their matt surfaces and the absence of shiny and semishiny zones, or at least zones of varying reflective power). However, oil paints are obtainable in a range of surfaces from reasonably flat to a gloss nearly as high as that of enamels. The trade recognizes three degrees of surface, namely, flat, semigloss (also known as eggshell), and gloss. Gloss and semigloss wall paints are called enamels rather than paints by some manufacturers. As a rule flat paints are preferred for large areas of walls and ceilings because they reflect light diffusely, which results in a "softer" appearance, more delicate control of the color effect, and more nearly even illumination free from glare. On the other hand, gloss paints are more resistant to water and stand more washing than the flat paints. It is the popular opinion that gloss paints resist soiling better than flat paints, but this is not true when the soiling comes from air-borne dirt. Gloss paints do become less seriously soiled than flat paints, however, when the soiling comes from finger marks or the splattering of grease or liquids.

All Interior Paints Very Different From House Paints

Wall paints for inside use differ materially from house paints in the nature both of the pigments

and of the liquids. As a rule, neither white lead nor zinc oxide is used in wall paints. For opacity and whiteness either titanium dioxide or zinc sulphide or a mixture of the two is used. The titanium dioxide is commonly provided in the form of titanium-calcium (a mixture of titanium dioxide and calcium sulphate intended for interior paints only), and the zinc sulphide in the form of lithopone (zinc sulphide and barium sulphate) or zinc sulphide-calcium (zinc sulphide and calcium sulphate). The major part of the pigment consists of calcium sulphate, barium sulphate, calcium carbonate, magnesium silicate and similar inexpensive pigments. Some wall paints, however, contain a small proportion of zinc oxide, which is especially desirable if the paint may be used in rooms that are likely to be damp for prolonged periods, since the zinc oxide helps paint to resist mildew. Mildew, however, is seldom a problem in residences.

Other important differences between the two types of paints are that the unbodied linseed oil used in exterior paints is seldom used in interior paints; also, the latter will contain a much larger proportion of volatile thinner, and still more if it is a semigloss or flat paint.

Important technical questions connected with the formulation of wall paints determine the degree of gloss. The principal determinant is the proportion *by volume* of total pigment and total non-volatile in the paint. Gloss and washability both tend to decrease as the "pigment volume" ratio increases [pigment volume: non-volatile].

Differences Between Gloss and Flat Paints

Unfortunately, manufacturers have very different interpretations of the distinctions between gloss, semigloss, and flat, whence there is no definite agreement on the pigment volume ratio for different degrees of gloss.

To understand the effect of varying pigment volume, it is helpful to consider that a coat of paint consists of a layer of finely powdered solids (the pigments) which packs together just so tightly but no more. When thus packed together there is a considerable volume of void spaces between the pigment particles within which the dried paint liquid is distributed. In a gloss paint there is enough dried liquid to fill all the voids between pigment particles, and some besides, which covers the mass of pigments with a smooth film. In a semigloss paint there is barely enough dried liquid to fill the voids and the surface is therefore slightly rough. In a flat paint there is insufficient dried liquid to fill the voids completely and they remain partly empty. The surface of flat paint is therefore rough enough to reflect light diffusely. Flat paints are somewhat porous; they can be made more porous by an increase in volume of voids in the pigment particles, or by a decrease in the volume of dried liquid in the paint. The volatile thinner, of course, evaporates as the paint dries. It is the non-volatile liquids that count in connection with the foregoing considerations.

Paint users should remember that addition of oil or varnish to wall paint decreases the pigment volume, increases the gloss, and may seem to alter the color. Wall paints, therefore, should be thinned, if thinning is necessary, with turpentine or mineral spirits only. Color may be altered when desired by mixing two paints of the same brand and degree of gloss (say, the ivory and the buff flat wall paint) or by tinting with colors-in-oil, provided that only very small proportions of the latter are required. It is not wise, however, to attempt to alter the degree of gloss by mixing, for example, flat wall paint with semigloss paint. Remember, too, that wall paints sometimes take several days to come down to the degree of gloss for which they are designed—that is, a semigloss paint or a flat paint may be unduly glossy for a few days after application.

Interior Primers and Priming

Proper priming or sealing of porous surfaces, such as plaster, is essential prior to the application of wall paint (except casein paints and the "calcimine coaters" mentioned subsequently). Unless so sealed, the porous surface drains liquid from the paint and seriously alters the pigment volume ratio, resulting in uneven gloss or less gloss than was expected. Practically all manufacturers of wall paints sell special wall primers to be used under their wall paints or else they sell a sizing varnish to be added to the wall paint for priming purposes. It is always wise to buy the primer of the same brand as that of the wall paint used. On new plaster, one coat of wall primer and one of wall paint should suffice. Some painters like to use glue sizing instead of wall primer because it is cheaper, but the economy disappears if the use of glue requires that two coats of wall paint instead of one be used; moreover, the paint job with glue sizing is less reliable than the one with wall primer. Fiber boards should be primed with wall primer just like plaster. The preferred practice among painters is to prime wood trim or plywood with house paint or house paint primer (see CR's October 1940 *Bulletin*) but this practice is, of course, open to the serious objection that when the paint coatings are not well maintained, the priming coat, like the superficial coatings, may in time become exposed by wear or abrasion and hence contribute lead particles to the air of the home. For finish coats on wood, gloss or semigloss wall paint or enamels are commonly used; flat wall paint may not be entirely suitable.

Repainting Over Old Interior Coatings

Consumers are likely to forget that in repainting they are limited to a considerable degree by the nature of the previous coating. For example, in repainting it is wise to use paint of the same degree of gloss as that of the old paint—that is, flat paint over flat paint and gloss paint over gloss paint. It is possible to make a change to paint of higher gloss (semigloss over flat or gloss over semigloss or flat), but the reverse (flat over gloss) should be avoided. Color may be varied from job to job as desired be-

cause all colors in any one brand of wall paint are usually much the same in composition (there is practically no demand for wall paints of dark colors). Gloss and semigloss paints usually can be repainted merely with one coat of paint, omitting the wall primer in repainting, provided that the color of the new paint is not too different from the old. When the old coating is of flat paint, however, it is difficult to tell whether one coat of new paint will be satisfactory or whether wall primer is needed first. If the old flat paint was not too high in pigment volume (i.e., not too porous) one coat of wall paint may prove satisfactory, but when in doubt it is safer to use wall primer first.

It is usually advised that calcimine be removed by thorough washing before new wall paint of any kind is applied. As a matter of fact that is not always done, but it takes unusual skill to apply calcimine over old calcimine, and no manufacturer of oil paint will accept responsibility for his products when applied over old calcimine. Nevertheless, if the user wishes to act at his own risk, it is often practicable to paint over *one coat* of calcimine (but no more than one coat) by first applying wall primer and then wall paint. Less objection is raised to painting over casein paint. This is true even if there are already several coats of the casein paint, but the risk of some peeling occurring increases as the thickness of the layer of casein paint increases. In any case, when applying wall paint over casein paint, it is essential that the surface be sealed thoroughly with wall primer before the wall paint is put on. Recently, there have appeared on the market special kinds of flat wall paint that can be applied directly over calcimine, casein paint, plaster, or wallboard without first using wall primer or wall size. These products are known as "calcimine coaters" or "one-coat flat" paints. They are economical in that they save time, and so should be popular in many types of work. Nevertheless, in quality and washability they are not quite equal to a good job with wall primer and wall paint.

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The following ratings of *interior wall paints* are cr41 and are based on a paint technologist's expert knowledge and study of composition and directions for application as stated on labels submitted by the manufacturers.[1] NOTE: Order of listings has no significance.

A. Recommended

Velour Finish (flat, gloss, and semigloss) (Devoe & Raynolds Co., Inc., N.Y.C.)

Super Quality Flat Wall Finish, Eggshell Finish, and *Interior Gloss Enamel* (Gamble Stores, Minneapolis)

Doublequick VelVeneer (flat), *Lo-Lustre* (semigloss), and *Gloss Wall Paint* (Jewel Paint & Varnish Co., 345 N. Western Ave., Chicago)

Keystona Flat Finish, Satin Sheen (semigloss), and *Gloss Finish* (Keystone Varnish Co., 71 Otsego St., Brooklyn, N.Y.)

Mellotone (flat), *Mello-Gloss* (semigloss), and *High Gloss Wall Finish* (Lowe Bros., Inc., Dayton, Ohio)

Best Quality Flat Wall Paint, Easycoat (semigloss), and *Interior Gloss-Coat* (Marshall-Wells Co., Duluth)

Certified Flat Wall Paint, Semi-Gloss Enamel, and *Gloss Enamel* (Montgomery Ward & Co.)

Sani-Flat, Dulamel (semigloss), and *Interior Gloss* (Benjamin Moore & Co., Newark, N.J.)

Pearl Paint (dull-sheen), *Pearlsheen* (semigloss), and *Atracto Gloss Coating* (St. Paul White Lead & Oil Co., Water & Starkey Sts., St. Paul)

Master-Mixed Flat Paint, Semi-Gloss Finish, High Gloss Finish (Sears, Roebuck & Co.)

Oiltone Flat Wall Paint (Seidlitz Paint & Varnish Co., 18th & Garfield Ave., Kansas City, Mo.)

Flat-Tone, Semi-Lustre (semigloss), and *Interior Gloss* (Sherwin-Williams Co., 101 Prospect Ave., N.W., Cleveland)

Barreled Sunlight Flat Wall Finish, Partial Gloss Finish (semigloss), and *Chinaline Enamel Gloss Finish* (U.S. Gutta Percha Paint Co., Dudley St., Providence, R.I.)

B. Intermediate

No-Lustre Finish (flat), *Interior Gloss Finish* (semigloss), and *Enamel-Kote* (gloss) (Acme White Lead & Color Works, 8250 St. Aubin Ave., Detroit)

Armello Flat Wall Finish, Arm-Glo Semi-Gloss, and *Interior Gloss Finish* (Armstrong Paint & Varnish Works, 1330 S. Kilbourn Ave., Chicago)

Kyanize Super Flow (flat), *Flat Wall Finish, Semi-Gloss,* and *Interior Gloss* (Boston Varnish Co., Everett, Mass.)

Flat Wall Paint, Interior Semi-Gloss, Interior Gloss (E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.)

Roman Flat Paint, Sof-Glow (semigloss), and *Northwestern Interior Gloss* (Hooker Glass & Paint Mfg. Co., 651 Washington Blvd., Chicago)

Lincoln Walamo Flat Wall, Lincoln Interior Semi-Gloss Finish (Lincoln Paint & Color Co., Lincoln, Nebr.)

Luco-A-Flat, Durafilm (semigloss), and *Durafilm Gloss* (John Lucas & Co., Philadelphia)

Minnesota Flat Interior Paint, Soft-Gloss (semigloss), and *Interior Enamel* (Minnesota Linseed Oil Paint Co., 1101 S. 3 St., Minneapolis)

BPS Pat-Co Flat Wall Finish, Satone Semi-Gloss, and *Gloss Interior Enamel* (Patterson-Sargent Co., Long Island City, N.Y.)

Wallhide Interior Flat Wall, Interior Semi-Gloss, and *Interior Gloss Enamel* (Pittsburgh Plate Glass Co., Pittsburgh)

Flattine (flat), *Wonder Koat* (semigloss), and *Klean-Kote* (gloss) (Standard Varnish Works, Port Richmond, S.I., N.Y.)

Namelflat Wall Finish (flat), and *Namelgloss Finish* (gloss) (Varcraft Works, Inc., Pottstown, Pa.)

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[1] The listings do not imply any guaranty that the paints named will all be entirely without some lead content. Such exact differentiation of paints is impracticable at the present time. All inside paints *may*, possibly at some times and not at others, contain lead in some form or amount, perhaps usually small, and there will thus always be some hazard with interior paints until there is a greater degree of standardization of formulas and methods in the industry—perhaps some degree of state governmental regulation of paint compositions, as there has been for many years in North Dakota. Paints and driers may even contain salts of mercury, antimony, cadmium, selenium, arsenic, or cobalt, from which it may be seen that paints represent an exceptional storehouse of poisons that may be slowly given off to the atmosphere and to the dust present everywhere, even in the most carefully kept homes. ¶*Roman Flat Paint* of Hooker Glass & Paint Mfg. Co. contains 5% of white lead in the pigment; some tinted and colored paints of many of the other brands may contain as much as 5% lead chromate.

Men's Rubbers and Women's Galoshes

Points to Consider When Buying Men's Rubbers

ROLLED edges of soles are good construction. If the edges are not rolled, they should be reinforced by foxing strips (extra strips of rubber along the edges). Heels should be thick and stiff. There should be an extra thickness of rubber at the counter, extending forward nearly to the shank. A lining wholly of rubber is best; when most of the lining is cloth, the lining at the back of heel, at least, should be of rubber. A strong edge to the upper is important to prevent tearing, for rubbers frequently tear at this edge when the rubber has aged and lost some of its resiliency either on the dealer's shelf or in use. Toes should be reinforced with cloth inserts (visible only on dissection).

Points to Consider When Buying Women's Galoshes

Like men's rubbers, women's galoshes should have extra thickness of rubber at the counters, and have thick stiff heels. Edges should be reinforced with foxing strips, since rolled edges are not commonly used on women's galoshes. Toe caps should be reinforced with cloth on the inside of the galosh. Tabs of good galoshes are firmly attached, and the crotch where the tabs come together is strongly reinforced. Four layers of fabric at this point are adequate to give sufficient strength. While the layers are not visible except upon dissection, extra thickness at the crotch, indicating reinforcement, may be felt between the fingers. Reinforcement of the rear seam is also desirable. Slide fasteners, which some people consider more convenient than snap fasteners, add about one-third to the price of women's galoshes. Slide fasteners make a more weatherproof closure. On the other hand, they often demand a strong tug to close, and sometimes jam.

Care of Rubbers and Galoshes

In order to prolong the life of rubbers and galoshes, they should be kept from oil, grease, and high temperature. It is also desirable to store them in the dark or at least away from strong daylight. Care should be used when putting on and removing rubbers not to strain the top edge more than necessary.

CR's Tests

The samples of men's rubbers tested were of two types or styles—the "sandal" type in which the upper is about the same height all around, and the "clog" type in which the upper extends up only a short distance, about 1 or 1½ inches, except at the toe and heel region.

All samples tested were black. CR's ratings of rubber footwear have been made on the basis of the way the footwear is constructed, its ability to resist abrasion, and the thickness of the rubber in the sole and heel. The rubbers and galoshes were dissected and examined for construction details important for good service; pieces of the heels were tested on a machine for resistance to abrasion.

Because of the good quality of the soles and heels and the low price of the *Gibraltar* brand rubbers, it is believed that a dollar spent in buying these rubbers would buy more service than two or even three dollars spent on the least satisfactory brands. Similarly, per dollar of expenditure, the *Trimline* women's galoshes may be expected to give twice as much service as the least satisfactory brands.

CR's price ratings of rubbers and galoshes are on the basis of amount of wear to be expected per dollar of purchase price quoted. Prices given are approximate average prices, since great variation exists in different sections of the country. Ratings are cr41.

Men's Rubbers

A. Recommended

Gibraltar, Sears-Roebuck's No. 76—9139. 89c plus postage. Clog type. In resistance to abrasion of the rubber compound and total wear-expectancy of sole and heel, one of two best brands of eight tested. Because of its low price, its wear-expectancy per dollar of price (including allowance for postage) was decidedly the best of brands tested. Details of construction, nevertheless, were not of high grade. **1**

Ball-Band Knox, No. 6151 (Mishawaka Rubber & Woolen Mfg. Co., Mishawaka, Ind.) $1.75. Sandal type. In resistance to abrasion of the rubber compound and total wear-expectancy of sole and heel, one of two best of the brands tested. On basis of wear-expectancy per dollar of its price, ranked second. Details of construction, relatively good. **2**

B. Intermediate

Cambridge Faille, No. 5714 (Cambridge Rubber Co., Cambridge, Mass.) $1.50. Clog type. In resistance to abrasion of the rubber compound and total wear-expectancy of sole and heel, average. Details of construction, somewhat above average. **2**

Commonwealth, Montgomery Ward's No. 26—4791. 89c plus postage. Clog type. In resistance to abrasion of the rubber compound and total wear-expectancy of sole,

below average. Because of its low price, its wear-expectancy per dollar of price was third in the group tested. Details of construction, relatively poor. 2

Goodrich Leeds Fit-All (B. F. Goodrich Rubber Co., Akron, Ohio) $1.50. Sandal type. In resistance to abrasion of the rubber compound and total wear-expectancy of sole and heel, below average. Details of construction, very good. 2

Servus Snag-Proof (Servus Rubber Co., Rock Island, Ill.) $1.29. Sandal type. In resistance to abrasion of the rubber compound, total wear-expectancy of sole and heel, and details of construction, about average. 2

U.S. Richmond Ardsley, No. MS555 (U.S. Rubber Co., 1792 B'way, N.Y.C.) $1.50. Sandal type. In resistance to abrasion of the rubber compound and total wear-expectancy of sole and heel, average. Best of the eight brands tested in details of construction. 2

C. Not Recommended

Tyer Men's Duane, No. 9541 (Tyer Rubber Co., Andover, Mass.) $1.50. Clog type. In resistance to abrasion of the rubber compound and total wear-expectancy of sole and heel, below average. Details of construction, relatively poor. 3

Women's Galoshes

A. Recommended

Trimline, Sears-Roebuck's No. 76—9701. 89c plus postage. Two snaps. In resistance to abrasion of the rubber compound and total wear-expectancy of sole and heel, one of two best brands of eight tested. Because of its low price, its wear-expectancy per dollar of price was decidedly the best of the eight brands tested. Details of construction, average. 1

Ball-Band Vida, No. 70375 (Mishawaka Rubber & Woolen Mfg. Co., Mishawaka, Ind.) $1.50. Three snaps. In resistance to abrasion of the rubber compound and total wear-expectancy, one of two best brands of eight tested. Details of construction, average. 2

B. Intermediate

Cambridge Edith, No. 8374 (Cambridge Rubber Co., Cambridge, Mass.) $1.50. Three snaps. In resistance to abrasion of the rubber compound and total wear-expectancy, below average. Details of construction, average. 2

Commonwealth, Montgomery Ward's No. 26—4514. 89c plus postage. In resistance to abrasion of the rubber compound and total wear-expectancy, below average. Details of construction, relatively poor. 2

Goodrich Spattershu (B. F. Goodrich Rubber Co., Akron, Ohio) $1.50. Three snaps. In resistance to abrasion of the rubber compound and total wear-expectancy, average. Details of construction, relatively good. 2

U.S. Olympia Belmont, No. WR506 (U.S. Rubber Co., 1792 B'way, N.Y.C.) $1.50. Three snaps. In resistance to abrasion of the rubber compound and total wear-expectancy, above average. Details of construction, average. 2

Converse Bonnie, No. L8650 (Converse Rubber Co., Malden, Mass.) $1.50. Three snaps. In resistance to abrasion of the rubber compound and total wear-expectancy, below average. Details of construction, relatively good. 3

LaCrosse Vogue Castle (LaCrosse Rubber Mills Co., LaCrosse, Wis.) $2. Slide fastener. In resistance to abrasion of the rubber compound and total wear-expectancy, average. Details of construction, relatively good. 3

Corrections to:

Consumers' Research Bulletin

Issue of January 1941

Page 13 second column, What Price Vitamins: Besides the suggestions given by the U.S. Dept. of Agric. for saving vitamins, it is judged desirable in the cooking of foods to start with boiling water or water which has been recently boiled, instead of cold water directly from the tap. (But one should *not* use water which has come from the hot-water tap.) It has been pointed out to Consumers' Research by a chemical authority that cold water freshly drawn is likely to contain much dissolved oxygen which, if used in cooking, can destroy a larger amount of the vitamins that are normally lost through the cooking process. Grandma's teakettle, always handy on the stove with boiling or boiled water for use in cooking, was, it now appears, a very good thing, in that it directly favored the conservation of vitamins in the cooking of foods.

Page 15 What Price Vitamins: Due to failure of manufacturer to mention his products' vitamin values in connection with the prices given in correspondence with CR, the vitamin A and D potencies of *Patch's* cod-liver oil were erroneously given as 850 U.S.P. units per gram and 85 U.S.P. units per gram, respectively. According to a correction in the *Supplement to New and Nonofficial Remedies* of the American Medical Association, issued after the January *Bulletin* was sent to press, the figures should have been 2000 and 200. The figures in columns 6 and 7 for *Patch's* cod-liver oil should, therefore, be amended to read:

Approx. No. of U.S.P. Units for 1c and CR's Price Rating—as to ***Vitamin A***		Approx. No. of U.S.P. Units for 1c and CR's Price Rating—as to ***Vitamin D***	
4,400	2	440	2
6,500	2	650	2
7,200	2	720	2

Welfare Economics *vs.* Consumer Welfare

This discussion of Professor L. J. Gordon's book, Economics for Consumers, *is more than a review—it is an important paper which answers questions that many high school and college teachers of the social sciences have asked themselves respecting the strongly marked recent tendency toward a leftist viewpoint and outlook in much of the teaching of consumers' problems. So obvious has been this tendency, indeed, that many businessmen and others have been led erroneously to suppose that all consumption-economists are radicals, and all in favor of the government-planned-and-regimented-economy of the socialist, communist, or fascist state. Such is not in fact the case. Research into consumers' problems is no more radical or destructive of the intrinsic nature of normal commercial and market relationships than are economic studies in production, marketing, taxation, or finance.*

In this study of a leading textbook for college use, the reviewer analyzes and explores the fallacies underlying the assumptions that are common to many leftist consumer-economists. The reviewer shows, with references to cited passages, that those assumptions are neither sound economics nor even in accord with good common sense, and any reader who cares to check the citations to the book itself will quickly see how unreal and untenable are the author's theories. The writer of this review is fully qualified to consider and compare the bases for the study of consumption problems in high school and college teaching, having himself both special training and long experience in this field.

On account of the importance of this paper, which had to be greatly condensed in order that room might be found for it in this Bulletin, *a fuller discussion of the book here reviewed and of the teaching and social-science questions it raises will soon be issued as a separate pamphlet.*[1]

Economics for Consumers, by L. J. Gordon. American Book Co., N.Y.C. 1939. 638 pages. $3.

I

THERE are two general schools of thought as to the function of professional educators. The first holds that educators should present *accurately and objectively* as much information as possible about the subject under discussion. From this fund of information the student then absorbs what he finds meaningful or of value. The second concept of education holds it to be the duty of the educator to evaluate experience and to stress only those aspects of reality which in the instructor's opinion are valid or worth studying. The student is taught what he "ought" to know and how he "ought" to think. The point of view is handed to him ready-made on the assumption that there is but one "right" way to look at things.

While most economists lean toward the first or informational type of education, there exists a sizable group of teachers of economics who advocate the second approach, in the name of human welfare. And in no branch of the subject are economists of the welfare type of mind so prevalent as in the field of consumption. In a relatively short time they have evolved a point of view that is rapidly becoming standard classroom doctrine on both the high school and college levels. Typical of this approach is a 638-page volume written by Leland J. Gordon, in 1939, under the title *Economics for Consumers*. According to the author, this book grew out of a course in consumption which he teaches at Denison University (Granville, Ohio). It is in no sense an unusual piece of writing or of research. On the contrary, it presents the orthodox welfare ideas in a pleasant but orthodox way. Its conclusions are important because they do fairly represent the views of a sizable majority of the professional teachers of consumption. And its weaknesses are notable because they are characteristic, not of one man, but of a very influential school of thought.

II

Welfare economists not only agree on matters of theory but are remarkably alike in their approach to and analysis of economic reality. Therefore, before turning to an inspection of the consumption aspects of welfare doctrine, it will be helpful to note certain of the specific traits of mind which Professor Gordon shares with the majority of his confreres. Most impressive of these is an almost naive conception of economic theory. Thus, Professor Gordon apparently embraces the idea that monopoly means inevitable restriction of output (p. 49); that expenditures on luxuries are invariably "waste" (p. 60); that an established business does not need repeat sales (p. 51); and that "genuine competition is alien to fashionable goods" (p. 152). He has no apparent comprehension of the difference between pure and perfect competition, he confuses cost curves with supply curves, revenue curves with utility schedules, and use value with exchange value (Chap. 13). Finally, he belittles Adam Smith's conception of economic man and then proceeds to set up a more impossible ideal of his own in the form of a "good buyer" who frustrates all of his human emotions, feelings, and drives, in order to buy "rationally" in terms of the purely

[1] Single copies will be available to teachers free on request, and to others at 10c the copy. (When 10 or more are ordered at one time, the charge will be 5c the copy.)

technological qualities goods may possess (pp. 310, 324, 334, 352, 354). The resulting confusion is at times disconcerting.

A second characteristic Professor Gordon shares with other welfare economists is the tendency to speak constantly in terms of abstractions that are either poorly defined or not defined at all. As might be expected, his goal is maximum welfare. This he states clearly in his preface in these words: "The main objective [of his book] is to discover and point the way toward wiser consuming practices calculated to promote human welfare" (p. iv). This objective is repeated at least once in every chapter. Yet at no place in the book does he define what he means by "welfare." The word is not even listed in the index. To further complicate matters, after saying in the preface that the main objective of his book is to promote human welfare, he observes on page 72: "Although an alluring picture can be drawn of an economy dedicated to human welfare, a realist must recognize that this is merely dabbling in the world of make-believe." And then, twelve lines later, he reestablishes the position of his book by asserting that "the real problem is to find a way to economic welfare through freedom of choice." Thereupon he immediately attacks the problem with an interesting disregard of the fact that he is "merely dabbling in the world of make-believe."

Starting as they do with vague concepts, it is not remarkable that both Professor Gordon and other welfare economists emerge quite frequently from their investigations with generalizations that are broad, superficial, and unsupported by adequate evidence. This constitutes a third distinguishing characteristic of the group and may be illustrated by the following generalizations from Professor Gordon's book:

1. The American public's aversion to cheese results from our custom of topping heavy meals with apple pie and cheese. Overeating causes indigestion which is incorrectly blamed on the cheese. (p. 32)
2. Soldiers wear uniforms because "the military caste regards itself as. . . superior." (p. 34)
3. "So unreal are the assumptions of capitalist economy that a poor soapmaker who advertises will do better than a good one who does not." (p. 173)
4. "Consumers. . . are the state." (p. 316)
5. "To the extent that Russian consumers have money with which to buy goods in an open market they have freedom of choice." (p. 70)

A moment's consideration of these generalizations will show their incompleteness or inaccuracy as explanations of the phenomena involved. However, their effect on students can be imagined.

Out of such generalizations grow the arbitrary value-judgments which constitute the fourth characteristic of the welfare group to which Professor Gordon belongs. This is possible because their entire discussion rests upon their own personal values, which they apply to all mankind. No alternative system of values is countenanced. Their argument may be summed up in one sentence: If you embrace the utilities I think important, you will foster your own welfare; if you deviate from my system of values, you will be dangerously foolish and sometimes wicked.

It should be noted in this connection that welfare economics would be impossible if its exponents did not regard themselves as capable of making just such far-reaching value-judgments. Knowing beyond peradventure of doubt what is "good" and what is "bad," they feel impelled to preach their own version of welfare to a miserable world. Granting that they mean well, it is certainly questionable whether arbitrary application of their views by all and sundry would produce the happy results they envision. Despite this fact the work of salvation proceeds with an enthusiasm unsullied by any doubts of the efficacy of their program. These people *know* how welfare is to be achieved, even though they have not defined the term itself and would have the greatest difficulty to formulate a definition satisfactory to others.

The first step in their educational program for teaching consumers how to achieve welfare involves a critical evaluation of the virtues and defects of the economy as it now exists (p. 310). Here appears the fifth characteristic of the welfare group. They do not like the status quo and are convinced that it must be changed drastically before welfare is possible (pp. 14, 48, 49, 60, 65, 70, 173, etc.). Professor Gordon's treatise, therefore, combines criticism of the American economy with sympathetic consideration of alternative systems which he considers more conducive to welfare. Because of its academic influence, inspection of this welfare thesis will indicate current trends in the indoctrination of students' minds and, at the same time, outline the characteristics of an utopian order toward which the welfare group hopefully asserts we are drifting.

III

Stripped of all elaborations, the welfare argument may be summarized in four propositions, each of which is well illustrated in Professor Gordon's book.

1. The first of these holds that consumers are a stupid but well-meaning lot whose ignorance and apathy lead to wasteful consumption and the frustration of consumer welfare (pp. 173, 243, 303, 353). Under the circumstances it is concluded that "wiser consuming standards" and "intelligent buying techniques" must be developed by someone "if consumers are to realize maximum satisfaction from their incomes" (p. 353). By "someone," Professor Gordon and his welfare associates refer of course to themselves. By "wiser standards" and "intelligent techniques" they mean their own standards and techniques.

This Bulletin Is *Not* Confidential!

This April *Bulletin* is a *General Bulletin* which may be shown freely to your friends, librarian, school teachers, club leader,—anyone who, in your opinion, would be interested in the service rendered by Consumers' Research.

As you may know, there are four *General Bulletins* each year issued quarterly in October, January, April, and June. This *General Bulletin* service is not confidential and may be obtained as a separate service. Subscriptions are open to libraries, schools, discussion groups and other organizations and to any individual who does not wish to subscribe to the regular monthly service. The subscription price is $1.00 (Canada and foreign, $1.50).

HELP US GROW

There are various ways in which subscribers can assist Consumers' Research to render an improved consumers' service such as sending us clippings from newspapers and magazines which contain items of consumer information, reporting experiences with products, making suggestions of brands to be tested, etc. Probably the most important way, however, to assist is by telling your friends about Consumers' Research. Practically the entire income of CR comes from *Bulletin* subscriptions. The larger the subscription income the wider the scope of the service, the greater the number of brands tested, and the more benefit CR's work is to you. The best promotion is the word of a friend, and your experience with Consumers' Research will go farther in persuading your friends of our competence, honesty, independence, and tangible value than any number of letters and circulars from us.

SHOW THIS BULLETIN

Show this *Bulletin* to your friends. Draw their attention to the next two pages. Tell them about the *Annual Cumulative Bulletin* and the exceedingly popular and closely read *Automobile Bulletin*. Tell them that the next two *Bulletins* will report on careful tests of refrigerators, gas ranges, vacuum cleaners and mattresses.

Above all, tell them how you use CR's service and how it guides your purchases, saves you money, and gives you the satisfaction of knowing you are getting your money's worth.

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"I estimate that I have saved at least $200 by following the recommendations in your Bulletins in the two years that I have been a subscriber."
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Constantine, Michigan

"Very sorry I didn't subscribe to your Bulletin sooner, —I would have saved much trouble and money."
JOHN P. SAKAS
So. Boston, Mass.

Let Consumers' Research Be *Your* Bureau of Standards

How often have you wondered what the real facts were about some product you were buying? Price alone is not a guide; sometimes the less expensive brand will serve your purpose just as well. Often a low- or moderate-priced product actually out-performs a high-priced one. The individual purchaser without professional advice has only the experience of past purchases to guide him. But when thousands of individuals work together it is possible, through the technical experts of Consumers' Research, to *know* the answers.

A Few of the Thousands of Brands Reported on by Consumers' Research

Electric Shavers

Gem-lectric
Gillette Dry Shaver
Schick Colonel
Shave-King
Remington
Sunbeam
Schick Captain
Rand Close-Shaver

Radios

General Electric
R C A
Westinghouse
Stromberg-Carlson
Philharmonic
Scott
Emerson
Philco

Cameras

Contax
Recomar
Speed Graphic
Argoflex
Argus
Perfex
Detrola
Leica

Toilet Soaps

Ivory
Palmolive
Sweetheart
Colgate's
Camay
Cuticura
Woodbury
Lux
Cashmere Bouquet
Kirkman
Lifebuoy
Lysol
New Fairy
Gondola

Refrigerators

Kelvinator
Westinghouse
Coldspot
Hotpoint
Norge
Crosley
Philco
Frigidaire
General Electric
Montgomery Ward

Razor Blades

Dublekeen
Thin-Flex
Gillette Blue
Gillette Thin
Wards
Marlin
Sta-Sharp
Windsor

Vacuum Cleaners

Westinghouse
Electrolux
Hoover
Eureka
General Electric
Delco
Rexair
Magic-Aire

Electric Steam Irons

Steam-O-Matic
Steam King
Mercury
Steem Electric
Steampoint
Steem Electric Automatic

Answers Your Daily Questions

Consumers' Research was organized to answer the questions which come to mind while making your everyday purchases. Nothing consumers buy is too small, nothing is too large for the technicians, chemists, and engineers to test to determine its real value to the consumer. From soap to automobiles, from phonograph needles to refrigerators—all are examined, tested, tried out and reported on from the viewpoint of your pocketbook and your needs. Many big corporations test products before *they* buy. As an individual you cannot afford your own laboratory; as a member of a group you can.

For New Subscribers

Consumers' Research, Inc. **Washington, N. J.**

☐ I enclose $3 (Canada and foreign $3.50) for one year's subscription to Consumers' Research *Bulletin*. I understand this will include the 19[illegible] *Annual Cumulative Bulletin* as well as all *Bulletins* issued during the coming year (none in July and August), including the 1941 *Annual Cumulative Bulletin*.

It is understood that my handling of any CR material which is made "The analyses of commodities, products, or merchandise appearing in issue of the CR Bulletin are for the sole information of subscribers" s be in accordance with that direction.

Name .....
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My profession or business is .....

CR-4-

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Furniture and Furnishings
Instruments Used in the Household
Automobiles, Parts, Accessories, Supplies
Paint, Enamel, Varnish
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Household Appliances and Equipment

Look at the Section Titles. The Information in This Book May Save You $100 Yearly.

The *Annual Cumulative Bulletin* for 1940 will be sent without extra charge to all who subscribe to CR's service at the present time. This means that a subscription will start with the current *Bulletin* and run for one complete year, including the 1941 *Annual Cumulative Bulletin* to be issued next September.

Ratings of 4000 Products Immediately Available

Thus a new subscriber will have for immediate use the reports on over 4000 products by brand name. Products are rated as "Recommended," "Intermediate" or "Not Recommended." These ratings are given on the basis of tests by trained chemists, technicians, and engineers. Frequently they make both laboratory tests and use tests to duplicate as nearly as possible the manner and method of use by the consumer.

Easy to Consult

To look up any product, turn to the alphabetical index in the back and there you will find the subject listed and the column number given. It is divided into sections according to the type of products discussed so that all related items appear together. Many sections are preceded by brief digests of basic information on how to buy and what to look for when buying.

The Complete Service

Consumers' Research is a non-profit organization supported and managed entirely by consumers and devoted to their service. Each month (except during July and August) a subscriber receives a CR *Bulletin* which brings the results of current tests on new brands and on a constantly expanding number of products.

The Automobile Bulletin

Issued in February of each year, the *Automobile Bulletin* gives an authoritative, extensive discussion and appraisal of new cars, giving each a rating as A, B, or C. If you are contemplating the purchase of a new car you should have this *Bulletin*. You will find it listed on the next page among Bulletins Previously Issued.

Use the Order Blank Today

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Consumers' Research, Inc. Washington, N. J.

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Name.....
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PREVIOUSLY ISSUED

For the benefit of new subscribers, the contents of CR *Bulletins* issued during the current volume year are briefly listed. Issues which are marked "Not Confidential" may be purchased by those who are not subscribers. All monthly *Bulletins* are 30c the copy.

OCTOBER 1940 (Not Confidential)

"Electric Clocks"—discussion of electric clocks and their care; ratings of 9 brands.
"Cooking Fats and Oils"—lard vs. hydrogenated oils; fats as shortenings; their nutritional values.
"Laxatives and Bowel Consciousness—A Clinical Study," by Manfred Kraemer, M.D.
"This Class-Ring Business."
"A Report on Children's Shoes"—requirements of a well-designed shoe; test methods; 13 brands rated.
"Reference Books," An Appraisal, by Professor MacEdward Leach—general buying advice; listings of leading encyclopedias of various types.
"Chalks, Art Colors, and Paints"—new test findings on many brands examined for lead, mercury, or arsenic.

NOVEMBER 1940

"Liquefiers"—ratings of the *Fletcherizer*, the *Waring Blendor*, and the *Liqui-Mixer*.
"Felt Hats for Men"—what to look for in buying; methods of test; ratings of 12 hats.
"Three-Dimensional (Stereoscopic) Photography," by Herbert C. McKay—an introductory article dealing with general aspects.
"Encyclopedias"—additional listings.
"Ice Cream Mixes"—general discussion of flavor and quality; ratings of 17 mixes.
"Home Building, IX"—another of the series on home building; deals with windows, putty and glazing, window glass, doors including overhead-type garage doors, fly screens, weather strips, awnings, moldings, Terrazzo flooring; a bibliography for home builders.
"A New Camera-Testing Service."

DECEMBER 1940

"Stereoscopic Cameras and Attachments," by Herbert C. McKay—discussion of equipment needed; printing; ratings of double-lens cameras and stereo-taking attachments.
"Razor Blades"—ratings of some 33 *Gillette*-type blades and 17 other type blades.
"Cameras for Color Transparencies"—general discussion of *Dollina II*.
"Automobile Heaters"—advantages and disadvantages of various types; ratings of 6 hot-water heaters of dashboard type, 4 hot-water heaters of under-seat type.
"Scotch and Irish Whiskeys"—discussion and ratings of 10 brands.
"Brandies"—ratings of 14 brands.
"Wines"—ratings of 43 brands of various types, such as sherry, port, muscatel, etc.
"Suspenders for Men"—ratings of 11 brands.
"Motion Picture Equipment"—ratings of *Revere*, Model 80, Series B, projector; and *Revere*, Model 88, camera.
"Power Tools for the Home Workshop"—ratings of many different tools.
"1941 Table-Model Radio Receivers"—ratings of 10 sets.

JANUARY 1941 (Not Confidential)

"Two More Automobile Heaters Tested."
"The New Wool Labels"—general discussion.
"1941 Radio Receivers"—brief summary of sets more fully discussed in the December issue and ratings of 4 additional sets; also listings of radios having similar chassis.
"Three Types of Cooking Utensils"—a pressure cooker, an aluminum saucepan, and a stainless steel saucepan.
"What Price Vitamins"—a general discussion of vitamin needs and best sources of supply together with tables showing relative economy of various vitamin preparations.
"Gasoline Consumption of the Low-Priced Cars"—miles per gallon at 3 nominal speeds of *Chevrolet*, *Ford*, *Nash 600*, *Plymouth*, and *Studebaker*.
"New Tests of Washing Machines"—ratings of 4 spin-dry machines and 8 wringer machines.

FEBRUARY 1941

"Automobiles of 1941"—ratings of 1941 cars and discussion of various parts and accessories including dual carburetion, automatic choke, automatic spark advance, voltage regulation, air cleaners, lubrication and oil filters, hydraulic clutches (fluid drive), wheel suspension, shock absorbers, headlights, heaters, windshield wipers.
"Automobile Oils—Winter Grades"—ratings of 37 brands of 10-10W oils, 26 brands of 20-20W, and 4 brands of 30 oils, purchased in different parts of the country.
"Men's Overcoats"—the results of CR's test of 7 overcoats of various types of fabric and a discussion of the various factors which go to make up a good overcoat.
"Radio Receivers—High-Fidelity Console Models"—ratings of 7 models including *Philharmonic*, *Ansley*, *Magnavox*, *Scott*, and *Stromberg-Carlson*.

MARCH 1941

"Radio-Phonographs with Recording Equipment"—ratings of 4 combination sets and 1 home recording converter unit.
"1941 Console-Model Radio Receivers"—ratings of 4 non-high-fidelity models.
"Stepladders"—ratings of 10 brands.
"Women's Umbrellas"—ratings of 6 brands.
"Low-Priced Phonograph Records," by Walter F. Grueninger.
"Stereoscopic Viewing and Projecting, III," by Herbert C. McKay.
"Flashlight Dry Cells"—ratings of 16 brands.
"Window Shades"—ratings of 15 brands.
"Venetian Blinds"—ratings of 9 brands.
"Women's Sanitary Belts"—ratings of 16 brands.

A BIBLIOGRAPHY OF BOOKS ON CONSUMPTION, 1930-40—SPECIAL BULLETIN 28

Following an introductory discussion of some general questions relating to bibliography of literature in the consumer field, this bibliography provides lists of general textbooks for high schools and colleges, and supplementary books of direct consumer interest on such topics as "buymanship," consumer credit, consumer cooperation, population problems, budgeting, health and the consumer, consumers and the social order, wealth and income, and other subjects.
(Not Confidential) 20 pages (mimeographed) 20c

A CONSUMER'S STUDY OF GASOLINES AND LUBRICATING OILS—SPECIAL BULLETIN 26

Discusses in detail properties of gasolines and oils, gasoline and oil dopes, and the latest authoritative information on the changing of crankcase oil. No ratings by brand name.
(Not Confidential) 17 pages (photolithographed) 25c

CONSUMERS' TEST MANUAL

For teachers of college and high school science classes who are interested in orienting their courses around consumers' problems, this Manual provides some seventy-five tests. Directions are set down in detail and lists of apparatus needed are provided. Included are tests To Distinguish Fresh Butter from Renovated Butter and Oleomargarine, for Gelatin in Ice Cream, for Starch in Face Powder, for Lead in Paint, etc.
(Not Confidential) 38 pages (including Index) 50c

EAT, DRINK AND BE WARY by F. J. Schlink

This book discusses the factory-originated trend, now well-nigh universal, toward refined, demineralized, and devitaminized foods. This trend has been followed by futile attempts to restore the old balance of nutritive elements that characterizes natural, unadulterated, honestly prepared foods, by putting over excessive roughage, vitamin D bread, canned orange juice, cod-liver oil, raw vegetables, and other diet quackeries. Diet fads indulged in by the poor and ignorant, and by the well-to-do and educated classes alike, are discussed.
Special CR Edition $1

2. The peril of the consumer is enhanced by the second point in the welfare argument, viz., producers sacrifice social, aesthetic, moral, and technological values to ensure profitable efficiency in production. On this issue Professor Gordon is quite bitter. The viciousness of businessmen is everywhere overgeneralized and repeatedly assailed (pp. 8, 9, 10, 48, 55, 127, 142, 173, etc.). However, the discussion of the process through which producers frustrate the consumer is at best confusing. First, it is admitted that consumers do not know what they do want, need, or desire (pp. 54, 173, 303). Then manufacturers are denounced for not accepting the consumer's judgment as to what he wants (p. 55), although the practical impossibility of producing to order is admitted (pp. 53, 54). In several places (pp. 9, 53, 55, 173) business is criticized for not giving the consumer what he asks for, but in other places it is asserted that "the present system yields practically all consumers want and much they do not want" (p. 54). In fact the consumer's confusion is said to be caused by "a veritable plethora of goods" (p. 9). For, under our present system, "it is unlikely that producers would fail to produce anything which consumers might possibly want" (p. 54). These are pretty important admissions about the functioning of a system whose asserted inadequacy, general ruthlessness, and inveterate exploitation of consumers' weaknesses Professor Gordon has so constantly and repeatedly stigmatized.

3. Like his welfare associates, Professor Gordon assumes that there is a just price for all products. This just price apparently is roughly equal to the cost of production of the product (pp. 13, 14). Moreover, cost of production is thought of as including only the expenses attendant on the creation of technological utilities. For this reason welfare is supposedly fostered only by products selected through a process of unemotional reasoning (pp. 310, 334).

On only one point should the consumer let his emotions affect choice. According to Professor Gordon, no "intelligent consumer" would think of buying a product without first determining whether "those [workers] engaged in producing the merchandise" are satisfied with their "wages, hours, and working conditions." "A general statement as to the labor policy of the manufacturer or the distributor, or both" is, in other words, a "necessary basis on which to make a wise choice" (p. 358). Just how the welfare people in general, and Professor Gordon in particular, arrive at this position is not clear. Their inconsistency with their previous insistence that purchase of goods must be a solidly rational and unemotional affair, coldly directed to the advancement of the consumer's own economic advantage, certainly warrants an explanation.

4. Professor Gordon, of course, is convinced of the validity of his faith. So sure is he of the rightness of his principles that he finds the use of legal restraints justifiable (p. 71) if consumers should, through ignorance, or apathy, or just because they're the kind of people they are, fail to recognize a friend when they see one (p. 322). Out of such conviction grows the welfare ideal in the form of a planned economy. Although Professor Gordon admits that "even if a [well-functioning] system of authoritative control could be established it is questionable whether it would succeed" (p. 72), he yet contends that such a system "might serve consumers better by supplying them only with those things conducive to individual and group welfare" (p. 71).

This utopia is spoiled for Professor Gordon by his conviction that consumers will fight, if necessary, to maintain their freedom of choice. Hence, the ideal state, which has been liberally considered through many pages, must be abandoned and "the real problem is to find a way to economic welfare through freedom of choice" (p. 72). From this point on, the way to welfare becomes increasingly obscure. Since consumers are stupid and whimsical children, they become, he says, easy prey for profit-seeking businessmen. Therefore, it is urgent that the consumer "study the products he needs and. . . acquire some knowledge of devices for measuring or ascertaining quality characteristics" (p. 355). But here again Professor Gordon is stopped by the fact that "human wants and the goods to satisfy them are far too numerous and complex for individual buyers to develop expertness in choosing" (p.309). He thereupon concludes that the main purpose of his book is "to present principles as a guide to action rather than factual information and rules of buying procedure" (p. iv).

The work of fostering consumer welfare is thus divided into two parts. The general principles governing what is good and bad, right and wrong, are to be presented by Professor Gordon and his associates. The factual information and the practical rules of buying procedure are to come to the consumer from other sources. But in reviewing these other sources he finds that "no educational agency other than business has made a serious effort to teach consumers how to play their part." And, as is to be expected, "businessmen's education of consumers is [has been] largely negative" (p. 323).

Apparently were it not for the fact that the welfare group is willing to present the general principles of "wise consumption," the consumer might well lose all hope. If even then some matters are not clear it is because the subject is a complex one, and the consumer cannot hope to be other than an ignoramus where complex questions are involved. Under the circumstances he should accept the welfare expert's opinion at its face value and then begin hunting for a research agency that will answer a "wise" buyer's questions about quantity, quality, price, and manufacturers' and merchants' labor

policies. Such is the theme of *Economics for Consumers.*

IV

One might well ask whether the legitimate ends of education are being served by such propagandizing. If the consumer is as stupid and unreasoning as Professor Gordon paints him (and we do not exaggerate Professor Gordon's characterization of him), there is no hope for his salvation. If, on the other hand, he may be conceded a modicum of intelligence, it is probable that he can decide for himself what constitutes the "principles of welfare" in his own case. *What the modern consumer needs is not a collection of generalized theories of value but rather the extensive development and increase of all the possible sources of practical information which will tell him the relative technical worth of the manufactured products he wants to use. The way in which the consumer then combines technical and non-technical utilities is his own business, and, if we are to stop short of an authoritarian control over every sort and size of enterprise, it must remain so.*

Certainly the increasing technical complexity of goods does not justify an economic revolution. Nor does the growing fertility of the economy warrant the establishment of a supreme authority on welfare. With a little technical advice the consumer can still be depended upon to spend his money effectively in the sense that he will buy what he himself prefers, what he wants most intensely. For the teacher to propagandize under the cover of presumably neutral and unbiased college teaching of economics and to press upon the students what it is their *duty* to want, as an obligation to some vaguely defined or undefined but unnamed and different economic order, is not mere presumption on the part of the teacher—it is a plain interference with those fundamental personal rights of the individual that we in the United States have considered our finest and most characteristic heritage.

Dictionaries and Children's Anthologies

In the October 1940 Bulletin we presented the first of two articles on encyclopedias and reference books compiled for Consumers' Research by Professor MacEdward Leach, of the Department of English Language and Literature of the University of Pennsylvania. The study, prepared in response to the large number of inquiries received on the subject from subscribers, brings up to date the previous reports which appeared in CR's Bulletins. We believe these two articles will be the most useful and complete source of information for the general reader, and that the judgments expressed may be accepted as having a high degree of reliability for the purposes of the average consumer.

The article in the October Bulletin discussed reference books in general, and listed encyclopedias, one-volume encyclopedias and reference books, annual encyclopedias and year books, children's and religious encyclopedias. This article deals with dictionaries for adult, grade, and high school use; dictionaries of usage; and anthologies for children. A note is also added concerning the need for caution in signing contracts for the purchase of subscription books and similar works.

THREE considerations should govern the choice of a dictionary: (1) is it up to date? (2) is it accurate? and (3) is it adequate for the purpose for which it is to be used? Up-to-dateness is, of course, important in a dictionary (especially for those persons dealing currently with business affairs or engaged in journalism or writing for the magazines). It is true that vocabulary, meaning, and punctuation do change very rapidly in a language; it is said that around 5000 words a year are affected in this way. For that reason a desk dictionary for school, office, or journalistic use should be replaced frequently, perhaps, every five years; an unabridged dictionary may be used two or three times as long. One cannot always tell the timeliness of a dictionary by the date on the title page. Some publishers print dictionaries from old plates with minor changes and a new title page bearing the current date. Especially should the buyer guard against "Webster's" dictionaries of this sort. The word Webster is not copyrighted; anyone who wishes can publish a Webster's dictionary. That accounts for the stacks of "latest Webster's dictionary" on sale in department stores at low prices, or given with subscriptions to magazines or newspapers. G. & C. Merriam Co., Springfield, Mass., publish the *good* Webster's dictionaries (unabridged, collegiate, student, and elementary). The American Book Co. also publish well-edited and trustworthy grade and high school Webster's dictionaries (see listings).

The amount and kind of revision a dictionary has undergone can best be checked by referring to authoritative reviews (like *Subscription Books Bulletin*), or by checking new words, like "ascorbic acid" [vitamin C], "pickup" [meaning a part of a radio phonograph], "video" and "iconoscope" [television terms], or "barrier-layer" [descriptive of a type of photoelectric cell]. One should take samples from different parts of the book. One well-known dic-

tionary's last "revision" was not continued past the letter H.

Accuracy is guaranteed by conscientious, well-trained lexicographers on the staff, and by editors with a free hand to carry out their ideas. That means much money, for it takes a great deal of research to put out a good dictionary. No small firm or fly-by-night publisher can afford to undertake the task.

The test of adequacy can be made by checking certain words in your particular field, or by comparing a random page with other dictionaries of the same class. The checking, of course, should not include new words only, but words with rich accretions of meanings and compounds (such as arch, diamond, character, fish), for some dictionary publishers, giving overemphasis to new terms, may displace some of the valuable detail on older words of infinitely more importance and utility. You will often discover padding, that is, inclusion of very special words, often at the expense of developed definitions of other words, to make the book seem for salemen's purposes, to have the largest vocabulary.

Dictionaries from the point of view of use fall into four main classes: dictionaries for scholars, general dictionaries for adults, juvenile dictionaries, and dictionaries of usage.

Dictionaries for Scholars

A. Recommended

New English Dictionary on Historical Principles, also called *The Oxford English Dictionary* (Clarendon Press, Oxford, England; Oxford University Press, N.Y.C.) 12 vols. 16,000 pages. Rev. 1933. $125. This is the great scholars' dictionary. It contains the scholarly histories of about 500,000 words in the main entries alone—every important word in English. It is the court of final appeal, but its very size, cost, and voluminous character bar it from general use.

There is in the making now (1940) at the University of Chicago under the editorship of Sir William A. Craigie and James R. Hulbert a *Dictionary of American English on Historical Principles* (University of Chicago Press). Projected: 20 parts, each $4, $75 the set. Parts 1-5 have appeared. It is to be completed in 1942. This will do for American English what the *Oxford* has done for English as a whole, and, like that dictionary, will be valuable largely for special consultation and for scholars.

See also the comments on the *Century Dictionary and Cyclopedia* (now out of print), mentioned in the footnote.

Dictionaries for Adults

For general use, an adult must decide whether he wants an abridged or unabridged dictionary. The unabridged dictionary contains practically every word in the language (not treated historically as in the *Oxford*). It contains a world of useful information and is the most practical all-round single reference book to be had.

Unabridged Dictionaries[1]

A. Recommended

Webster's New International Dictionary (G. & C. Merriam Co., Springfield, Mass.) 2nd ed. 1934. $20. This is the best unabridged dictionary available. It contains 650,000 entries, 11,500 illustrations. It is up to date, authoritative, complete. It is the only commercial dictionary that uses the scholarly method, taking words, definitions, and pronunciations from actual popular usage. Its editor, Thomas Knott, is the foremost English-language specialist and lexicographer in America.

B. Intermediate

The New Standard Dictionary (Funk & Wagnalls, N.Y.C.) 2814 pages. 1913. $18. This work does not seem to merit so high a rating as the *New International*. It is considered that it has not really been well or fully revised since 1913. The practice of inserting new words by cutting down definitions of others and omitting words has resulted in what the present reviewer considers rather inaccurate and spotty work. The two-volume edition with the added outline of history is judged not worth the extra $15 it costs.

Desk Dictionaries

A. Recommended

Shorter Oxford Dictionary (Clarendon Press, Oxford, England; Oxford University Press, N.Y.C.) 2 vols. 2500 pages. 1936. $18. Excellent; based on the big *Oxford*. British usage. It contains much fuller definitions, illustrations of use of words, and etymologies than the *Webster Collegiate*. But since the *Collegiate* is American in usage, is adequate for all ordinary use, is in one volume, and is considerably cheaper, it may be preferred by many. (One with $20 to spend will usually find the *Webster's New International* a better purchase.)

Webster's Collegiate Dictionary (G. & C. Merriam Co., Springfield, Mass.) 5th ed. 1936. 1274 pages. $3.50. This is an abridgment of the *New International;* like that work, it is thorough, accurate, scholarly. It contains nearly all the words an adult might meet in general reading, and many thousands of more common technical and special words. It is complete with reference tables, biographical dictionary, gazetteer, etc.

B. Intermediate

College Standard (Funk & Wagnalls, N.Y.C.) $3.50. ¶The same work available under the title *Practical Standard Dictionary*, but priced at *$5*.

Concise Oxford Dictionary (Clarendon Press; Oxford University Press) 1929. $3.50. Most useful to editors and

[1] Persons who recognize the importance of careful and precise use of words and who wish to bring up their children to exercise care and discrimination in language, may find it well worth $20 or so (price charged for buckram binding), to buy a secondhand set of the *Century Dictionary and Cyclopedia*, published by The Century Co., N.Y.C. The last edition of this dictionary (1911) was in 12 volumes. This dictionary would serve many of the purposes of an encyclopedia, especially for young people, and its treatment of the meanings and derivations of words, with selections of examples of usage, is among the best available in any dictionary. Such a dictionary is of no use, of course, in connection with recent terms and terms which are changing rapidly in their meaning or connotation. But for a young person coming into contact for the first time with the meanings and value of words, their origins and traditions, the newest in terms and meanings is of relatively minor importance.—Editors.

teachers; excellent definitions and illustrations of usage. Needs revision. British usage.

Some additional listings of less desirable dictionaries will appear, if space permits, in the May *Bulletin*.

Juvenile Dictionaries

High School Dictionaries

Special dictionaries for high school use are not justified from an educational standpoint. The high school pupil should preferably be provided with one of the desk dictionaries listed previously. Consideration of price, however, may lead one to choose a high school dictionary.

A. Recommended

Desk Standard Dictionary, also called *High School Standard Dictionary* (Funk & Wagnalls, N.Y.C.) 1934. $2. This is a good book, lately revised. 85,000 entries, many illustrations.

Webster's Secondary School Dictionary (American Book Co., N.Y.C.) 1929. $2.20.

Webster's Student Dictionary for Upper School Level (G. & C. Merriam Co., Springfield, Mass.) 1938. $2.48.

B. Intermediate

Macmillan's Modern Dictionary (Macmillan Co., N.Y.C.) 1938. $1.80.

Grade School Dictionaries

There is real justification for a dictionary especially edited for the lower school grades. The following listings include, it is believed, the desirable dictionaries for such use.

A. Recommended

New Comprehensive Standard School Dictionary (Funk & Wagnalls, N.Y.C.) 1938. $1.32. A new book; it does not follow the old *Standard* style.

Thorndike-Century Junior Dictionary (Scott, Foresman & Co., N.Y.C.) $1.32. Based on the *Thorndike* word lists but definitely not as accurate, clear, or complete as *Webster's* and *Winston's*.

Webster's Elementary Dictionary for Boys and Girls, edited by G. & C. Merriam Co. (Distrib. American Book Co., N.Y.C.) $1.20. An excellent juvenile dictionary.

Winston Simplified Dictionary for Schools (John C. Winston Co., Philadelphia) $1.28. Carries the student through junior high school. Generally accurate, clear; definitions illustrated by phrases. 1700 illustrations, some in color. Excellent. ¶The abridgments represented by the Shorter Edition (96c) and Primary Edition (80c) are not recommended.

Dictionaries of Usage

Dictionaries of usage are often of more practical aid than the conventional dictionaries or grammars.

A. Recommended

Dictionary of Modern English Usage, by H. W. Fowler (Oxford University Press, N.Y.C.) 1926. $3.25. The first really valuable dictionary of usage. Though somewhat old, and British, and not comprehensive or exhaustive, this is a valuable book.

An Index to English, by Porter G. Perrin (Scott, Foresman & Co., N.Y.C.) 1939. $1.50. This is the best book on the subject; it covers every problem of usage from vocabulary to complications of grammar. More convenient to use than the *Dictionary of Modern English Usage*, and written from the American point of view.

Get It Right! by J. B. Opdycke (Funk & Wagnalls, N.Y.C.) $3.50.

Anthologies or Compilations of Literature for Children

The only excuse for an anthology is to provide reading matter for people who do not have access to libraries and who cannot buy the books in individual volumes. The practice of abstracting and excerpting matter from books and dishing it up in collections is to be deplored. A child should read his books whole, as he is ready for them. He should be taught to think of books as entities, not as sections in an anthology. Parents are advised to put the money that they would spend for one of these anthologies into individual volumes and to supplement these by books from the library. Many books a child wants to read only once.

The compilers of anthologies claim that they contain the selections best for the child and that they are graded. No general group of selections and grading can meet the needs of any child as well as those planned by a careful parent, making use of the Bulletin, *Books for Home Reading*, prepared by Max J. Herzberg and Stella S. Center (National Council of Teachers of English, 211 W. 68 St., Chicago) 25c. This contains full lists of graded reading matter with short reviews. It indexes much more material than is to be found in the anthologies. A similar guide is *Best Books for Boys and Girls* (Parents Institute, Inc., 52 Vanderbilt Ave., N.Y.C.) 1938. 25c.

Single-Volume Anthologies

Many single volumes of children's literature are making their appearance. The purchaser should examine these in a bookstore before buying the high-priced sets. The following anthologies and handbooks list and grade other books and classify the selections as to time and culture.

A. Recommended

A Book of Children's Literature, by Lillian Hallowell (Farrar & Rinehart, N.Y.C.) 942 pages. 1939. $3.75.

Children's Literature by Grades and Types, by O. Depew (Ginn & Co., N.Y.C.) 1938. $3.25.

Introduction to Literature for Children, by E. Rawlinson (W. W. Norton, N.Y.C.) Rev. ed. 1937. $3.75.

Juvenile Sets of Literature

For those who wish information about the high-priced sets of children's literature, we list the following. (Some additional ratings of less desirable sets will appear, if space permits, in the May *Bulletin*.)

A. Recommended

Children's Hour (Houghton, Mifflin Co., Boston) 10 vols. $16. An excellent medium-priced collection. *A Guide to Children's Hour*, uniform with the set, can be purchased for $2.75; this is useful in grading this material, and organizing it for parents who want to direct their children's reading.

My Book House (The Book House for Children, Chicago) 12 vols. 1937. $49.50; $33 to libraries. Graded. Much new material, attractive format, illustrations, etc. Most of the material has been edited and "adapted." Judged to be overpriced.

My Travelship (The Book House for Children, Chicago) 3 vols. $18.50; $9.75 to schools and libraries.

B. Intermediate

Childcraft (The Quarrie Corp., Chicago) 8 vols. 1937. $39.90. Two editions: one, the "parent series" with a guide to assist parents in using this with children: the other, the "teacher series."

Lands and People: The World in Color (Grolier Society, N.Y.C.) 7 vols. 1938. $39.90. Various parts of this can be purchased separately. Maps and geographical material accurate but judged to be overpriced.

Picturesque Tale of Progress (The Book House for Children, Chicago) New ed. 1935. $45. A revision of *My Book of History*. An attempt to popularize world history by use of literary material. Grades 6-10.

The New Junior Classics (P. F. Collier, N.Y.C.) 10 vols. 1938. $39. Many stories are shortened; others represented by selections.

* * *

Editors' Note: In buying subscription books and similar works, it is vitally important to take special pains, through a signed, written statement of exactly what is ordered, to see that no possibility can exist for misunderstanding about the precise style and quality, binding material, etc., of the volumes ordered or the manner of paying for them, and all other essential conditions of the purchase or promises made by the salesman.

Many consumers assume that they may disregard certain of the terms of the contract they have signed, because they had an "understanding" with the salesman that certain clauses would not be enforced, or that some modification is acceptable to the company and has been accepted by the salesman on behalf of the company. Any "understanding" which you, the purchaser, have with a salesman or agent can be of no practical use to you if differences later develop as to manner or rate of payment or any other essential discussed in the written contract. Consumers should clearly understand that if the contract has been signed in formal manner, it is valid—that what is in it is binding and what is *not* in it is *not* binding upon the company. The only practical means of protection for the purchaser, after he has read every clause in the contract, is not to sign it if he would be unwilling to be bound at some future date (due to uncertainties of income or for any other reason) by each and every clause that appears in it.

How to Care for Porcelain Enameled Ware

ARE you in the habit of cleaning your porcelain enameled sink and tub with scouring powder? Such treatment is too harsh for new plumbing fixtures and will eventually ruin their white, glossy surface, though it is true that gritty cleaning powders may be necessary on fixtures which have been roughened by long abuse with harsh and caustic cleansers. Porcelain enameled fixtures that are in good condition should be regularly cleaned with nothing more damaging than a scrubbing brush, laundry soap, and hot water. When stains and dirt are not removed by this treatment, then try a little scouring powder known to be of fine grade – such as *Bon Ami* or the whiting-trisodium phosphate mixture* recommended by CR. Always remember that use of all the common kitchen scouring powders will produce fine scratches and make the porcelain more difficult to clean during the years to come, while its appearance will go downhill steadily, until in 5 or 10 years it will (in extreme cases of hard and frequent scouring) no longer look well enough to go with a well-kept home. To avoid staining and ruining of enamel, don't let food residues such as fruit juices, potato peelings, or tea and coffee grounds, remain on the enamel for long periods; the well-known triangular corner strainer should not be left in the sink with remnants of fruits and vegetables from which juices drip slowly for hours on end. Keep faucets in repair so that constant dripping of water will not leave stains of iron or copper from the piping on the porcelain; and finally don't let photographic chemicals, medicines, and drain pipe solvents come into contact with the porcelain.

A small booklet which gives good advice on caring for porcelain enamel, "It's Easy to Keep This Lustrous Finish," may be obtained on request accompanied by a 3-cent stamp by addressing Sanitary Cast Iron Enameled Ware Assn., 1108 Clark Bldg., Pittsburgh, Pa.

* 9 parts whiting, 1 part trisodium phosphate, well mixed.

Planting Design

Planting Design, by Florence Bell Robinson, Assistant Professor of Landscape Architecture, University of Illinois. McGraw-Hill Book Co., Inc. 1940. 215 pp., illus. $2.75.

LANDSCAPE architecture is the art of arranging areas of land and the various objects upon them for the use and enjoyment of human beings, and providing pleasing arrangements, textures, color, and general appearance.

The author states that it does not so much matter what plants are used as how they are used. She calls attention to various types of houses and shows how plantings can be varied to soften and adapt the lines of the house to fit into the landscape. The ultimate results of unity and harmony "are obtained by the application of the principles of simplicity, balance, scale, sequence and focalization, applied to the plant factors mass, texture and color."

In the landscape, there are two broad categories in color use: (1) in the flower garden, and (2) in the general landscape. In work where color is a concern, we have to do not only with the color effect of the object itself, but of the surroundings. The harmony of sequence is secured through the use of a series of closely related (as to spectrum) colors. Harmony of contrast involves the use of complementary colors. In the general landscape, the major effects will be obtained with greens. Gray greens, when properly used, will give the effect of distance and of spaciousness, while dark greens tend to fill up space and give an appearance of nearness. Harmonious color effects are obtained by simplicity, scale, balance, gradation, and focalization or climax.

Texture is another one of the characteristics of materials that make up "plant personality." Texture will appear coarse, medium, or fine, depending upon size of leaves or of twigs, the spacing of the leaves or twigs, the shape and division of the leaf, the surface quality of the leaf, the length and stiffness of the petioles. In near views, large leaves appear coarse, and the coarseness is even greater in effect when the leaves are widely spaced. Small leaves give fine texture. Glossy leaves or leaves that are whitened on one side reflect spots of light, and so impart a sense of brightness or gaiety to the scene. Texture is also affected by the density or clarity of the atmosphere, the age of plants, and the season of the year. Coarse texture appears nearer, fine texture farther away from the observer. In general, plantings will have the corners strengthened with coarser texture, the center will be treated with medium texture, and the sides made more delicate with fine texture. A low hedge will have fine texture, and a tall hedge, coarse.

The third factor of plant personality is mass. Mass and form are complementary. Texture and color are both related to mass. Two plants may have the same form, but a difference in texture or color will make a difference in the mass expression.

When a conical or peaked plant is used among rounded plants, the observer will be conscious of disharmony. To attain harmony, there must be a similarity among the forms of the plants used, or at least a sequence of slight differences to give a transition.

Simplicity of line, form, and mass is vital, and a few forms well arranged contribute to this more greatly than a collection of many sorts. Scale is essential, that is, the scale relations of the plants to themselves and to their environment. In all views there should be some sort of axis, which is supported by balance in planting. Balance of symmetry is that between two plants or two masses of plants of like size, color, form, texture. A more subtle form of balance is occult balance, or balance of interest, where a mass of similar forms of different sizes may be opposed to a larger mass of one plant of similar form.

"Planting design is a design in three dimensions of open spaces and masses, of light and shade, and of the elements that create these spots—form and texture and color." A pattern must first be selected, formal or informal. The point of emphasis or focus must be located. The masses are then arranged and finally the individual plants are selected to make up the masses. This is the reverse of the usual process, of first selecting the plants and then trying to work them in.

The foundation planting about the house is the most common application of planting design—or lack of it. All foundations do not need planting. The foundation planting is designed to tie the house to the ground and to soften some of the homely angles. Is the house resting upon the ground? Or is it upon a cushion of shrubs? The color of the background should be considered in the selection of plants. (Red brick is not a suitable background for forsythia.) Texture should be considered, for the planting should blend with the building. The dominant lines of the building, be they vertical or horizontal, will have a bearing upon the form or mass of the plants used.

This book sets forth important principles in planting design; some of these are briefly set forth above. Professor Robinson's book is the best available on these principles. Selection and arrangement of plants is an art, and the book should be read with that in mind. The owner's individuality should be expressed in the exterior as well as in the interior of the home. Houses of the same structural characteristics should no more be treated alike than should women of like build wear identical clothes.

CHARLES H. CONNORS
Prof. of Ornamental Horticulture
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Selecting a Farm Tractor

by Carlton L. Zink [1]

THE kind of work to be done will determine whether to select a tractor of the conventional four-wheel, or standard-type, chassis, the three-wheel type (sometimes called tricycle or row crop), or a "tracklayer" (crawler or caterpillar).

For farm work other than the tending of row crops the four-wheel tractor may be quite satisfactory. Tractors of this design are best adapted to plowing, discing, seeding, and other operations common to the raising of small grain.

The tricycle-type chassis is designed for row crop work and provides maximum visibility, maneuverability, and clearance for the crop being tended. Tricycle tractors having a fixed tread usually have considerable side draft when pulling a plow. Adjustable rear wheel tread permits the reduction if not the elimination of side draft. It is desirable that there be provisions for easily changing the tread width in small steps. The tricycle-type tractors are not as stable as the four-wheel type and for that reason are not as suitable for high-speed hauling. When tricycle tractors are operated at the higher road speeds it is very important, for safety against over-turning, that the rear wheel brakes be evenly adjusted and that they be operated simultaneously from one foot pedal or hand lever. Well-designed tricycle-type tractors can be used to do all of the field work ordinarily found on farms where row crops are raised.

The tracklayer (crawler or caterpillar) type of tractor chassis has the reputation of being able to operate under very adverse conditions. It does perform better than the wheel tractor on steep slopes, exceptionally rough ground, very soft and springy soil, and deep mud. The tracks also negotiate loose, sandy soil very well, but the track life is relatively short under such conditions. It is difficult to keep thin mud or muddy water from working into the bearings of the track rollers and the track pins. This type of chassis is more expensive to build and maintain than is the wheel type. Some rubber-tired tractors have displaced the tracklayers on loose, sandy ground, such as is found in many orchards, because of the cost of track maintenance.

There is only one crawler of the row-crop type on the market at present and that is the *Cletrac HG*, Nebraska Test No. 324. Crawler tractors, equipped with the ordinary steel track, seldom are used at speeds over 5 to 6 miles per hour because of the excessive power loss in the flexing of the track at high travel speeds.

Tests of Tractors

In 1919, the Nebraska State Legislature passed a law requiring that a stock tractor of each model be tested before that model could be offered for sale in the state. The testing work was delegated to the Agricultural Engineering Department, University of Nebraska.

Mimeographed copies of tractor test reports issued by the University are available to the public at 5c per single copy. For a fee of $1 per year these reports are sent to a subscriber as they are issued, without the necessity of further correspondence.

A yearly bulletin, called *Nebraska Tractor Tests*, which summarizes the data on tractors that have been tested and are still on the market as of January 1, is available in single copies at no charge.

The A.S.A.E. and S.A.E. ratings on the belt and drawbar given in these bulletins represent the amount of power that the tractor should be able to deliver consistently over long periods of time. The belt rating is 85% and the drawbar rating is 75% of the maximum horsepower that the tractor can deliver under standard conditions of temperature and barometric pressure.

These ratings are useful in comparing tractors. If, for instance, 30 belt horsepower is required to operate a 28" threshing machine under good conditions (following a rule of one horsepower per inch of cylinder length), then by checking the belt ratings of tractors shown on the Summary sheet of *Tractor Test Bulletin 330*, one may find several tractors that will handle the load.

The *Massey-Harris 101 Jr.*, test 359, with a rating of 27.40 would do the work if conditions were favorable; the *101 Senior*, test 307, with a rating of 31.30 at 1500 rpm, would have more reserve power to take overloads due to wet or long straw, fast feeding, etc. Some other tractors that have approximately the required rating are the *Farmall M* tests 327 and 328; the *Case D* and *DC;* the *M-M* Model ZTU, on gasoline, and Model UTS, on distillate; the *Oliver 70*, on gasoline; and, if you want a Diesel engine, the *IHC WD-6*, with a rating of 30.92.

If the number of pounds required to pull a certain implement is known, then by examining the test data it is a simple matter to select a tractor that will pull that load at the desired speed. One method is to work from the known to the unknown. Drawbar horsepower is obtained by multiplying the pounds of drawbar pull by the rate of travel in feet per minute and then dividing by 33,000 (the number of foot-pounds per minute which equal one horsepower).

The fact that horsepower is determined by both pounds pull and rate of travel is often forgotten. The *Case CC*, when it was tested in 1929, developed a drawbar rating of over 17 horsepower. The travel speed on the rated load drawbar test was 4.19 miles per hour, and the drawbar pull was 1,599 pounds. Some observers, not realizing that it takes both speed and pounds pull to determine horsepower, were surprised that the *Case CC* did not pull two plows any easier than some other tractors having a much smaller drawbar rating but which traveled about 25% slower in their "plow" gear.

The draft of plows will vary greatly, from as low as 3 pounds per square inch of furrow slice in light, sandy soil to as high as 25 pounds in extremely hard

[1] The author, a technical expert and authority on farm tractors, is Engineer in Charge of Tests at the University of Nebraska.—Editors.

soil. Tests indicate that the draft will increase with increased travel speed. Two and one-half miles per hour has been used as a standard and the increase in pull required is 10% to 11% for each additional mile per hour. Eight pounds per square inch of furrow slice is a common value used for many mid-western soils. A 14" plow bottom working at a depth of 7" would turn a slice having an area of 98 square inches. Eight pounds per square inch times 98 square inches equals 784 pounds. Three 14" bottoms plowing 7" deep would have a draft of 2,352 pounds. The *McCormick-Deering W-4*, test 353, on gasoline, with a rated load drawbar pull of 2,362 pounds, would handle it easily; likewise the *Farmall H*, test 333, also on gasoline, with a pull of 2,211 pounds, should be suitable; the *Case D* and *DC* would pull it ¼ to ½ mile per hour faster and do it easier than the first two. The *Massey-Harris 101*, the *Oliver 80 KD* either standard or row crop, and the *John Deere G* all could be used on the three 14" bottoms. If the ground was light then they could pull four, and if it was exceptionally heavy, then they might do well to pull two.

Tractor Fuels

Fuels most commonly used in tractors are gasoline, distillate, tractor fuel, kerosene, and Diesel fuel.

Gasoline is the most desirable fuel for use in internal combustion engines. Modern gasoline-burning tractor engines are equipped with cylinder heads having a compression ratio of from 5.9—6.75 to 1 and require a fuel having an octane rating (A.S.T.M.) of 70 to 72. The high price per gallon of gasoline often makes it less practical to use than less expensive low-grade fuels. Where operating conditions are favorable to the low-grade fuel, it is not considered economical to pay more than 3c premium for gasoline. If the work is such that there are many starts and stops with a great deal of idling then the user can afford to pay a greater price differential for the more volatile fuel.

The terms "distillate" and "tractor fuel" are rather indefinite and have been used to cover a wide range of low-grade fuels. Tractor fuels, in many localities, are divided into two groups. Those known as "hot" quite often have a distillation range within that of gasoline. The "cold" tractor fuels are known to many users as distillates, or No. 1 furnace oils. The modern tractor engine equipped to burn low-grade fuel can handle "cold" tractor fuel satisfactorily if the operator will properly adjust the manifold heat and the cooling-medium temperature controls.

One of the essential specifications of the fuel for any engine using a carburetor is the octane value. The more acceptable tractor fuels will have octane values ranging from 30 to 45, while the less desirable distillates will run from 20 to 30, and kerosene often as low as 0 to 10 octane. Kerosene was once a popular low-grade fuel because of its uniform quality; but with the desire for more power and the move to higher compression ratios, it is now seldom used because of its low octane value. More and more manufacturers are making recommendations as to the minimum octane number of the fuel to be used. International Harvester Co.'s octane recommendations are "30 to 40, over 40 desired," while Allis-Chalmers advises the use of a fuel having an octane of 30 or more, and Oliver specifies a minimum of 36.

In order that low-grade fuel may burn properly in a carbureted engine, a high cooling-medium temperature must be maintained, from 190° to 207° or 208°F, depending upon the design of the engine, the load, and the quality of the fuel. The manifold heat control should be set to produce a sufficiently high incoming fuel charge temperature to eliminate dilution. That adjustment can be obtained from the manufacturer's instruction book or from observation made on the particular fuel being used under the prevailing atmospheric temperature and power requirement conditions. Some method of cooling-medium temperature control should be provided, such as a high temperature thermostat, a radiator shutter, or both. The manual controls for the radiator shutter and manifold heat valve should be within reach of the operator on the tractor seat.

The small consumption of low-cost fuel by Diesel engines is an attractive feature of this type of tractor engine. The best carburetor-type engines will operate on the belt with a fuel economy of 12 to 13 horsepower hours per gallon, while Diesels under the same conditions will obtain from 14.5 to 15.8 horsepower hours per gallon. Modern Diesel engines if serviced properly are long-lived, but the fuel injection systems are easily injured by dirty fuel. Contrary to the popular opinion that Diesel engines will burn everything from "rubber boots to butter," they do require clean fuel of a uniform quality. Be sure that the Diesel engine you purchase has a good fuel filtering system to remove all foreign material before it reaches the fuel pumps.

The higher initial cost of Diesel-equipped tractors makes it a doubtful economy to buy one to be used less than 1,000 (some say 2,000) hours per year.

Other fuels occasionally used because of economic advantages involved are butane, alcohol (both straight and blended with petroleum products), and producer gas.

Butane is a very desirable fuel largely because of its low cost, the good economy, and the long motor life usually obtained when using it. The fact that it vaporizes at relatively low temperatures makes it necessary to have it at all times in closed tanks under pressure.

While it is true that alcohol-blended fuels can be used in internal combustion engines with a fair degree of satisfaction, it is difficult to justify their use at the present cost of producing the alcohol.

Producer gas is used only where the limited supply and high cost of suitable petroleum products make their use impractical.

Rubber Tires or Steel Wheels

Approximately 90% of the wheel tractors sold at the present time are mounted on rubber tires. Rubber tires offer the following advantages: decreased rolling resistance, which means that less engine power is required to propel the tractor and, hence, more power is available at the drawbar to do useful work; lowered fuel consumption, with savings amounting to 15% to 25%, over that required

by a steel wheel equipped tractor to do the same amount of work; increased comfort for the operator as a result of the cushioning effect of the rubber tires; extended tractor life, for the same qualities that give increased operator comfort protect the tractor chassis from vibration and distortion.

Rubber tires may extend the usefulness of the tractor, for a rubber-tired tractor will serve to pull trailer-loads of farm products to market, provided it is equipped with brakes and steering mechanism that are adequate for safe operation on the highways.

Work in the hayfields or in pastures or other choice grassland may be done with rubber-tired tractors with much less damage than would be the case if steel wheels and lugs were used. The least possible amount of damage will be done by rubber tires with smooth tread. Soft, loose, sandy soil may be more readily traversed with rubber than steel wheel equipment.

Violent bouncing of the rubber-tired tractor when operating on rough ground can be materially reduced by filling the tires ¾ full of liquid ballast. If the tractor is to be used at temperatures below freezing, an antifreeze, preferably a calcium chloride solution of the proper strength, should be used to prevent the formation of ice crystals and possible damage to the inner tube. Freezing of the liquid ballast in the partially filled tire would result in an unbalanced condition of the tire and wheel which would make operation of the tractor hazardous, particularly at high speeds.

Disadvantages of rubber tires are: high initial cost; service difficulties such as punctures, slipping on the rim, etc.; and the inability to obtain sufficient traction on muddy ground. Special tread designs are available for work under very wet conditions as in the rice fields. Tire chains are used by a very small number of owners whose tractors must operate under especially adverse conditions.

The tractor manufacturer usually selects one tire size as standard and has available at extra cost one or two over-size tires and perhaps an under-size tire. In the majority of cases either the standard or the smaller over-size tire is most practical. Rubber tire traction is primarily dependent upon the amount of weight carried by the rear tires. If engine power is not the limiting factor, then additional weight placed so that it is carried by the rear, or driving wheels, will increase tire traction with a resultant increase in drawbar pull. One hundred pounds of added weight will increase traction sufficiently to permit an increased drawbar pull of about 50 pounds. Where the soil is loose and conditions are unfavorable, the gain will be as low as 35 pounds, and where the footing is very good, the increased pull will be as high as 65 pounds per 100 pounds added weight. The total static weight on each tire should not exceed the recommendations of the Tire & Rim Manufacturers' Association for the given size of tire and inflation pressure used.

The amount of weight carried by the rear wheels may be increased by filling the tires with liquid ballast, by mounting cast-iron discs or weights on the rear wheels, by filling the portion of the wheel between hub and rim with concrete, and by raising the tractor drawbar higher so that more weight is transferred from the front to the rear wheels when the tractor is pulling a load. This last-mentioned adjustment should not be carried so far that steering is difficult because of the tractor being too light in front. Two cast-iron wheel weights, in addition to the liquid ballast, will provide sufficient traction for the average farm tractor.

The most popular tire tread for ordinary farm work is one known as the "high-profile." The *Firestone Ground-Gripper* and the *Goodyear Hi-Cleat* are two examples. This type of tread is best suited for operation in cultivated fields. Tractors equipped with high-profile tires do not roll as easily as ones having low-profile treads. The latter is represented by the *Firestone Chevron*, the *Goodyear Diamond*, and others, and is best adapted to use on firm footing such as dry hayland, country roads, or dry stubble. On many industrial applications the low-profile tread is used because of its greater "rubber to road" contact area, with resultant longer tread life. The high-profile tread, because of its flexibility, will not permit as high a drawbar pull on a hard, smooth surface as will the low tread, assuming of course that all other factors are equal.

Some treads clean better than others and it would be well to determine, by talking with owners, by observing their tractors or the dealer's demonstrators, the most satisfactory tread for the work to be done. Another point that should be checked is whether the tractive quality of the tire is as good in reverse as it is in the forward gears. Dual tires can be used advantageously on some row crops because of their ability to cling to lister ridges. They also have some value in loose ground operation where the degree to which the soil particles cling together and resist the tire action is the limiting factor. Where duals are to be used on heavy soil, care should be taken to select a wheel that will provide the maximum amount of clearance for the wet soil or clods to pass between the two tires and not to build up solidly from one tire to the other. On some large tractors dual tires are used because single tires do not provide enough traction to utilize the full engine power. As a general recommendation, singles are preferable to duals.

Steel wheels, if selected, are available in two general types, the so-called solid rim and the open or skeleton wheel. The solid, or wide rim wheel, rolls easier in loose ground than the narrow rim or skeleton type but does not clean as well. The narrow rim wheel with overhanging spade lugs is well adapted to use where the top soil is loose or muddy, but firm at a depth of a few inches.

Tools

Pull-type implements may be used with a number of makes of tractors but integrally mounted tools may be used only on the particular make and size of tractor for which they were designed. All of the mounted implements should be investigated before the decision is made to purchase a certain tractor. Adaptability to the work to be done, time and effort required to mount or remove the tools, ease of handling the tools when in use, strength and simplicity of design—all are factors to be weighed.

Dealer Service

It is an advantage to have nearby a dealer-representative for your make of tractor who maintains a good stock of repair parts and a well-equipped, well-manned shop, particularly if the tractor owner, himself, is not mechanically inclined and lacks a good farm shop.[1]

Remember that lower re-sale value and greater depreciation may be expected for any tractor that is not well represented in the community by both users and dealers.

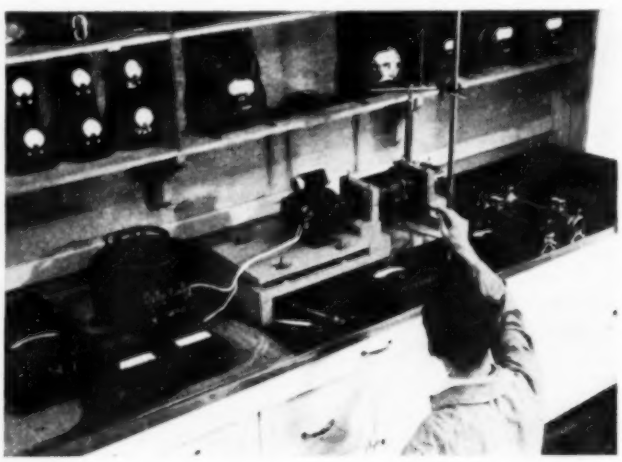
The best tractor for a given farmer to buy is oftentimes not the cheapest tractor; on the other hand it need not be the highest-priced one.

[1] *Tractor Repair and Maintenance, Circular 499*, by R. I. Shawl, a 57-page fully illustrated pamphlet, gives helpful advice on how to obtain economical service from a tractor. Obtainable from Extension Service, University of Illinois, Urbana, Ill.—Editors.

Electric Motors for Home Use

Their Intelligent Selection, Care, and Use

THERE has been a remarkable development of home craftmanship as a hobby, in recent years. With the growing tendency towards shortening the hours of labor, people have utilized their leisure on new hobbies and pastimes, and many are selecting home shop work as a hobby that provides real opportunities for creative expression and pleasure in workmanship. Office and clerical workers, lawyers and engineers, all find the home shop a restful change from the drive and routine of office work at a desk. Useful and interesting articles and gadgets can be constructed and many repairs about the home made with more ease and pleasure if one has the aid of a few simple power-driven tools. (The advanced hobbyist often goes in for an astounding variety of expensive and sometimes complex small machinery.)



Testing the power of a household electric motor.

Many of the tools used by the home shop call for an electric motor drive, but it is not easy for the home craftsman to select the right type for the job he has to do.

First he should determine the type of power available, i.e., whether direct or alternating current, its voltage, and its frequency if it is alternating current.

The price of motors does not run in proportion to their size, for a motor of a type and size in large demand may be more cheaply priced than a motor of smaller power less widely sold. The big-production size of motor will be likely to be more efficient and reliable.

Many makes of 1/4 and 1/6 horsepower motors are available. The 1/4 horsepower motor is generally accepted as the most practical size for many homecraft uses. The most usual speed for the 1/4 horsepower a-c induction motor is 1725 or 1750 revolutions per minute.

All alternating current induction motors (motors which when running at full speed have no electrical connection between the rotating element and the field or stator) present problems of starting under load. When the machine to be driven puts no particular starting load on the motor, a split-phase-start induction motor may be used. When the starting load is considerable, as with water pumps, air compressors, cream separators, etc., a capacitor-start induction motor, or, better still, a *repulsion-start* induction or a repulsion-induction motor is called for. The repulsion-start induction motor is likely to have a smaller cost for upkeep over a period of years than the capacitor-start induction; but on the other hand, the original cost will be higher.

Ball bearings, though preferred for dust-free or carefully protected installations, are not so good as the cheaper bronze sleeve bearings where gritty dust may get into the motor. Roller bearings are preferred where a tight belt connection is necessary.

The presence of dust or moisture also determines whether the motor can be open or must be fully enclosed. The latter type is more expensive.

The efficiency of motors is very important to factory operators, but relatively unimportant to the home shop worker because the total energy used will usually be small.

The voltage actually afforded by the line at the outlet where the motor will be used should be that shown on the motor's rating plate, and, if different therefrom, should be slightly above rather than below. In this way, overheating and possible burnouts will be avoided. As an aid to maintaining the correct voltage, a motor having a "high power factor" is desirable.

Good mechanical construction, insulation, bearings, and cooling are also important. The purchase of a used motor of the required type, though it can produce a considerable saving to a careful buyer, is not without considerable risk.

Motors should not be loaded so heavily that the speed falls below its rated value. Continued overload operation will burn out the motor. The speed given on the name-plate is that for rated horsepower output.

Motors should be oiled as directed by the manufacturer. Any motor should be kept clean and dry and free from dust and waste oil. It should be operated in a place where the air can circulate freely; and should not be operated at full load in rooms of abnormally high temperatures, since most insulating materials are injured by excessive temperatures.

When cleaning a motor, dry dust may be blown out by a vacuum cleaner. Do not use a violent jet of high-pressure compressed air. If the motor is taken apart, oil may be washed from the windings with kerosene or carbon tetrachloride, *used sparingly*. Exposed windings may be given a coat of insulating varnish when needed. The bearings should be carefully washed with carbon tetrachloride [outdoors; do not breathe the vapors], reoiled with clean oil, or repacked with grease. Handle bearings carefully. A very small amount of grit can do a great deal of damage to bearings. Always use *clean* oil or grease. Thoroughly dry out the motor before reassembling and operating.

Any one interested in learning more about the operation, selection, installation, and care of electric motors would do well to obtain the 29-page illustrated pamphlet, *Electric Motors for the Farm, Farmers' Bulletin No. 1858*, obtainable for 5c from the Supt. of Docs., Washington, D.C.

The following factors were considered in testing the motors listed: locked-shaft current, temperature rise under full rated load, starting torque, torque limit, efficiency, power factor, and electrical safety. Only one motor successfully met all test requirements as judged by reasonable and commonly accepted standards. All motors, however, passed the proof-voltage tests for electrical insulation, and none caused radio interference except for slight clicks when starting. In the majority of cases, the makers did not supply adequate or complete name-plate data, especially as related to allowable temperature rise under full load. All motors had simple provision for reversing the direction of rotation though in most cases this called for interchanging of certain wires (after, of course, disconnecting the motor from the line). All models in the test were intended for operation on 110-volt, 60-cycle alternating current. Locked-shaft currents of all split-phase motors tested were in the high range of 36 to 42 amperes. ¶In the interest of safety, it is suggested that the frame of all motors be securely and permanently grounded before use, wherever practicable. Ratings are cr41.

A. Recommended

Craftsman, Sears-Roebuck's No. 99—5585. $11.90 plus shipping charges. (Nearest equivalent motor sold under same brand name in latest catalog at $11.45 lacked reversing switch, and apparently had different make of ball bearings.) 1/3 hp, capacitor-start type. Met most test requirements except that current with shaft locked (approximately equivalent to starting current under full load) was somewhat high. Motor failed by small margin to meet insulation resistance test. Starting torque relatively low, but torque limit (maximum momentary torque) good. Efficiency above average, but power factor low for capacitor-start motor (59%). Had built-in reversing switch, and was equipped with automatic overload-protection device, or thermal-delay circuit-breaker (both very desirable, the latter especially so). **1**

Powr-Kraft, Montgomery Ward's No. 484—9843. $12.95 plus shipping charges. 1/3 hp, capacitor-start type. Met all test requirements except that locked-shaft current was somewhat high. Starting torque and torque limit, good. Efficiency highest (69%), but power factor low for capacitor-start motor (59%). Had built-in reversing switch and ball bearings; also was equipped with automatic overload-protection device. **1**

Century, Type CSX, Frame 6TAY (Century Electric Co., St. Louis) $11.60. ¼ hp, capacitor-start type. Met all tests except for slight deficiency in insulation resistance. Locked-shaft current lowest of any motor in test, but starting torque was also low (about 1/3 that of *General Electric* Type KC). Torque limit only 222% of full load (lowest of motors in test). Power factor very good (73%). This motor would be suitable for continuous duty but should not be used for hard-starting loads; neither is it well adapted to temporary overloads. **2**

General Electric, Model 5KC47AB490C, Type KC (General Electric Co., Schenectady, N.Y.) $11.60. ¼ hp, capacitor-start type. Met all test requirements. Starting torque by far the highest, torque-limit third highest, of any motor in test. Power factor, 67%. Had next to lowest operating temperature at full load (a favorable feature). **2**

Leland, Type K, Form AOT, Style 1 (The Leland Electric Co., Dayton, Ohio) $11.60. ¼ hp, capacitor type. Met all test requirements except that for insulation resisance. Had second lowest locked-shaft current, average starting torque, and very favorable performance on torque limit test. Power factor very good (91%), efficiency next to highest (67%). Had lowest operating temperature at full load. **2**

B. Intermediate

Companion, Sears-Roebuck's No. 99—5618. $6.25 plus shipping charges. ¼ hp, split-phase type. (Not listed in latest catalog, but No. 99—05618 at $6.75 appears similar.) Locked-shaft current, high. Failed, by small margin, to meet requirements for insulation resistance. Starting torque, average; very favorable performance on torque limit test. Efficiency was average, power factor lowest, of split-phase motors tested. Met test requirements for full load operating temperature. Motor was equipped with automatic overload-protection device. Current consumption understated on the rating plate. **1**

General Electric, Model 5KH45AB55B, Type KH (General Electric Co.) $7.15. ¼ hp, split-phase type. Locked-shaft current was high, but had lowest value of

split-phase motors tested. Starting torque, torque limit, and efficiency all about average. Power factor good for split-phase type. Rise in operating temperature at full load slightly exceeded rated value. **1**

Leland, Type K-SX, Form AOW JH (The Leland Electric Co.) $7.15. ¼ hp, split-phase type. Locked-shaft current, high. Under one set of test conditions motor failed to meet insulation resistance requirements, but fault was not found in tests made later. Starting torque about average, torque limit somewhat below average. Efficiency was somewhat below average, power factor highest, of split-phase motors tested. Rise in temperature at full load exceeded rated value. **1**

Powr-Kraft, Montgomery Ward's No. P484—9854. $6.75 plus shipping charges. ¼ hp, split-phase type. Locked-shaft current, high. Efficiency and power factor both average, starting torque and torque limit below average. Rise in temperature at full load exceeded rated value. Motor was equipped with automatic overload-protection device. **1**

Westinghouse, Type FH, Frame X145Z (Westinghouse Electric & Mfg. Co., Lima, Ohio) $11.30. ¼ hp, capacitor-start type. Motor failed by small margin to meet insulation resistance requirements. Locked-shaft current desirably low, and starting torque next to highest of motors in test. Torque limit, below average. Efficiency, lowest of capacitor motors tested. Power factor, about average. Rise in operating temperature at full load exceeded rated value. Motor was equipped with automatic overload-protection device. **2**

C. Not Recommended

Century, Model SP-63J-AH4-503D (Century Electric Co.) $7.15. ¼ hp, split-phase type. Locked-shaft current, high. Temperature rise at full load, highest of any motor in test (a serious defect in motors). Failed by small margin to meet requirements for insulation resistance. Starting torque low, torque limit about average. Efficiency was above average, power factor slightly below average, of split-phase motors in test. Current consumption, understated on the rating plate. **1**

Westinghouse, Type FH, Style 952128 (Westinghouse Electric & Mfg. Co.) $7.45. ¼ hp, split-phase type. Locked-shaft current high. Failed to meet requirements for insulation resistance. Starting torque and torque limit both better than average. Efficiency and power factor both somewhat below average for split-phase type. Temperature rise at full load, next to highest of motors tested. **1**

Garden Seeds

WHEN purchasing garden seeds, look on the label for the percent germination and date of test, both of which are given by good seed companies (particularly for vegetables). Percent germination of some vegetable seeds, onion seeds for example, diminishes rapidly; hence the germination test should be recent (within the year). Federal laws require that the germination of vegetable seeds be stated on packages shipped in interstate commerce if they do not meet certain minimum requirements (which are not difficult to meet).

Some states have protective seed laws. Ask your state agricultural college for its reports on the products of various seedsmen as inspected in your state. Your public library may have such reports in file, or can get them.

IN the recent past there has been a notable growth of interest shown by Americans in Latin America. That interest has its cultural and educational, as well as its commercial, basis. The teaching of Spanish in schools and colleges has received a tremendous impetus; a periodical published in this country is currently offering a Spanish translation of each issue for wide distribution in Latin America; and one monthly magazine that has come to our attention, published in a Spanish-speaking country, offers Spanish translations and excerpts of articles appearing in leading North American and Latin-American popular journals and newspapers.

On the commercial side, many American manufacturers, seeing their European markets cut off by the war, are now turning toward Mexico and Central and South America, in the hope of raising their exports to those countries to a level that will compensate for the loss of customers in Europe and Asia. Steamship and travel agencies offering service to Latin-American countries are preparing for a busy season, to accommodate the tourists who in other years spent their summer vacations in Southern France, or hiking in the Black Forest.

One result of these closer cultural and trade relations between the nations of the Western Hemisphere will be a greater availability of all types of American goods in Latin America. And that, in turn, will mean that the interest and value of CR's *Bulletins* in Spanish-speaking countries is likely to increase greatly in future. (Readers will be interested to know that a recent issue of the leading newspaper in Buenos Aires carried advertisements for *twenty-two well-known brands of American goods;* twelve of the twenty-two were cosmetics and toilet preparations.)

If any reader of CR's *Bulletins* has a friend or relative or a professional, academic, or business associate now living in any Latin-American country, who, in view of the trends just referred to, might make good use of CR's service, from either a personal, general economic, or educational standpoint, we will be glad to forward to such persons, material describing the work and bulletin services of Consumers' Research.

Miscellaneous New Listings

Enlargers, Photographic

A. Recommended

De Jur "Versatile" (De Jur-Amsco Corp., Shelton, Conn.) $79.50 less lens, $102 with *Wollensak* 4¼ in. f:4.5 lens. Other lenses of various focal lengths available. Used 75-watt *Mazda* opal enlarging bulb; double condenser with heat-absorbing filter glass. Designed for 2¼ x 3¼ in. or smaller negatives. Negative holder provided with model tested, suitable only for one size negative (2¼ x 3¼ in.) but a universal negative holder for all sizes up to 2¼ x 3¼ in. available at extra cost. Negative held between metal plates without glass cover plates. Head moved on metal column, counterbalanced by metal tape connected to spring, rollers being used to reduce friction. Focusing was by means of a friction drive and was accomplished either by lens or negative movement. Worm-gear adjustment provided for moving negative around a single horizontal axis and out of parallel relation to lens board for distortion control. Entire head assembly could be rotated so that instrument could be used for horizontal as well as vertical enlarging. Focusing and adjusting mechanisms worked well and with sufficient smoothness for the purpose. Linear magnification on baseboard with 4¼ in. lens, about 7 times; removable lens board permitted use of other lenses of different focal lengths. Alignment, evenness of illumination, and quality of lens provided, good. Rigidity, satisfactory. Workmanship and ease of operation, very good. (NOTE: Some enlargers of earlier production were reported to have a defect of negative alignment, but this was not present in the specimen tested.) **3**

Photographic Exposure Meters

Photoelectric Type

B. Intermediate

De Jur, Model 5A (De Jur-Amsco Corp., Shelton, Conn.) $11.50, leather case, $1 extra. Designed for film-speed ratings 0.3 to 200 *Weston*. Dial for light readings marked in arbitrary units from 1 to 20, but booklet accompanying meter gave foot-candle equivalents (from *1.5* to *1200*) for each dial division. Compared with *Weston 650* meter, this meter called for longer exposures. This is not considered of great importance, however, as a user of a photoelectric meter will always be required to adjust his practical use of the meter to the lens and shutter, camera, film (and film developer) with which it is used. **2**

De Jur "Critic," Model 40 (De Jur-Amsco Corp.) $15.50. Designed for film-speed ratings 0.3 to 800 *Weston*. Dial for light readings marked directly in foot-candles (*0.1* to *4000*). Gave readings substantially the same as *De Jur, Model 5A*. All dials enclosed, and pointer somewhat better damped than that of *Model 5A*. Otherwise, the lower-priced *Model 5A* is considered to be equally as good (it is of more convenient size and its dial is somewhat more easily read). **3**

Preventing Mildew

MILDEW on fabrics can be prevented, according to the U. S. Department of Agriculture, by a simple treatment first with a solution of laundry soap and then with a solution made with crystals of cadmium chloride in water (cadmium chloride is available at drugstores; if your druggist doesn't carry it, he can order it for you). The treatment may be applied with advantage to shower curtains, tents, tarpaulins, awnings, or canvas covers of porch furniture. The following directions are given by the Department of Agriculture:

> Have the cloth thoroughly clean. Heat it in a solution of 1 to 2 ounces of soap to the gallon of water. About 1½ gallons will cover a shower curtain. Heat 20 minutes, remove the cloth and squeeze out excess soap. Put the wet cloth into a second solution of cadmium chloride crystals, 3 ounces to the gallon of water. About 1½ gallons is required. Heat for about 30 minutes, wring out, and dry without rinsing. Hang to dry on a twine line (a metal line may stain the fabric). This treatment does not affect the color of the curtain which will be resistant to mildew until laundered again.

Since cadmium compounds are quite poisonous, as are most or all substances which have an inhibitory effect on minute plant organisms such as constitute mildew, precautions should be taken to prevent children's getting hold of the chemical either in the crystal or water-solution form, or putting the treated fabric in their mouths.

A Bibliography of Books on Consumption, 1930-1940—Special Bulletin 28. This is a non-confidential issue, which we believe will be of special interest and value to all teachers and students of consumption economics and "consumer problems." Following an introductory discussion of some general questions relating to bibliography of literature in the consumer field, the bibliography provides lists of general textbooks for high schools and colleges, and supplementary books of direct consumer interest on such topics as "buymanship," consumer credit, consumer cooperation, population problems, budgeting, health and the consumer, consumers and the social order, wealth and income, and other subjects.

CR will be glad at this time to fill orders from teachers and others for this bibliography, now available in mimeographed form at 20c the copy (20 pages).